

**EPA Superfund
Record of Decision:**

**CRYOCHEM, INC.
EPA ID: PAD002360444
OU 03
WORMAN TOWNSHIP, PA
09/30/1991**

Text:

SOURCE AREA - SOIL) ADDRESSES SOIL CONTAMINATED BY PAST FACILITY OPERATIONS. AFTER EPA ISSUED THE PROPOSED PLAN FOR OU2 (AREA-WIDE GROUND WATER) AND REVIEWED ADDITIONAL INFORMATION WHICH BECAME AVAILABLE DURING THE PUBLIC COMMENT PERIOD FOR OU2, EPA DETERMINED THAT ADDITIONAL ALTERNATIVES TO REMEDIATE CONTAMINATED SOIL AT THE SITE SHOULD BE DEVELOPED AND THE PUBLIC PROVIDED THE OPPORTUNITY TO REVIEW AND COMMENT ON THESE REMEDIAL ALTERNATIVES. THUS, EPA DECIDED TO SEPARATE RESPONSE ACTIVITIES AT THE SITE INTO ANOTHER OPERABLE UNIT. THE ELEVATED LEVELS OF HAZARDOUS SUBSTANCES DETECTED IN SOIL BEHIND THE FABRICATION BUILDING INDICATE THAT SOLVENT DISCARDED BEHIND THE FABRICATION BUILDING MAY HAVE CONTRIBUTED TO GROUND WATER CONTAMINATION AT THE SITE. CONTAMINATED SOIL CONTINUES TO CONTRIBUTE TO THE THREAT POSED BY THE SITE SINCE HAZARDOUS SUBSTANCES CONTINUE TO LEACH FROM THE SOIL INTO THE GROUND WATER SYSTEM AND INTO SURFACE WATER VIA OVERLAND FLOW.

#SHEA

SITE HISTORY AND ENFORCEMENT ACTIVITY

CRYOCHEM, INC. HAS BEEN MANUFACTURING METAL PRODUCTS, PRIMARILY PRESSURE VESSELS, AT THE SITE SINCE 1962. THE METAL FABRICATION PROCESS HISTORICALLY INCLUDED THE USE OF A SOLVENT CONTAINING TCA TO WIPE AWAY DYE USED TO CHECK FOR FAULTY WELDS. BETWEEN 1970 AND 1982, CRYOCHEM, INC. REPORTEDLY USED THE SOLVENT AT A RATE OF TWO TO THREE 55-GALLON DRUMS PER YEAR.

A SERIES OF ENVIRONMENTAL SAMPLES COLLECTED BETWEEN 1981 AND 1985 BY PADER, CRYOCHEM, INC. AND EPA HAVE REVEALED THE PRESENCE OF TCA, 1,1-DICHLOROETHANE (DCA), 1,1-DICHLOROETHENE (DCE), TRICHLOROETHENE (TCE), AND TETRACHLOROETHENE (PCE) IN AN ON-SITE PRODUCTION WELL AND IN NEARBY RESIDENTIAL WELLS. TCA, DCA, DCE, TCE, AND PCE ARE HAZARDOUS SUBSTANCES AS DEFINED IN CERCLA. THESE FIELD INVESTIGATIONS AND THE RI/FS STUDY DETECTED THE PRESENCE OF TCA, TCE, PCE, DCA, ETHYLBENZENE AND XYLENE IN ON-SITE SOILS.

IN MAY 1985, EPA CONDUCTED A SITE INSPECTION (SI) AT THE SITE AND COLLECTED SAMPLES FROM SOIL, GROUND WATER AND SURFACE WATER. THE RESULTS OF THE SAMPLING WOULD BE USED LATER TO DETERMINE IF THE POTENTIALLY CONTAMINATED MEDIA AT THE SITE WOULD REQUIRE CLEANUP UNDER SUPERFUND. IN JUNE 1985, EPA RANKED AND SCORED THE SITE ACCORDING TO THE HAZARD RANKING SYSTEM (HRS). THE HRS EVALUATES HAZARDOUS SUBSTANCES, DEFINED IN CERCLA AND IDENTIFIED AT A SITE, THEIR MIGRATION ROUTES AND THE POTENTIAL RECEPTORS, (I.E., POPULATIONS THAT COULD BE EXPOSED TO THE CONTAMINANTS), AND THEN CALCULATES A SCORE WHICH DETERMINES THE RELATIVE HAZARD POSED BY A SITE. IF A SITE SCORES GREATER THAN 28.5 IT CAN BE RECOMMENDED FOR THE NATIONAL PRIORITIES LIST (NPL) MAKING IT ELIGIBLE TO RECEIVE FEDERAL MONEY FOR INVESTIGATION AND CLEANUP. THE CRYOCHEM SITE SCORED 28.58, PROPOSED FOR THE NPL IN JULY 1987, AND WAS ADDED TO THE NPL IN OCTOBER 1989.

IN SEPTEMBER 1987, EPA SAMPLED WATER FROM RESIDENTIAL WELLS WITHIN 1/4 MILE OF THE CRYOCHEM PLANT. DUE TO THE DETECTION OF ELEVATED LEVELS OF DCE, AND OTHER COMPOUNDS, EPA'S SUPERFUND REMOVAL PROGRAM INSTALLED DUAL, ACTIVATED-CARBON FILTER UNITS IN THIRTEEN HOMES. A FILTER UNIT WAS PLACED IN EACH HOME WHERE THE REMOVAL ACTION LEVEL OF 23 UG/L (PPB) OF DCE IN DRINKING WATER WAS EXCEEDED. IN 1991, EPA PLACED CARBON FILTER UNITS AT FIVE POTENTIALLY AFFECTED ADDITIONAL HOMES AND ONE BUSINESS. FIGURE 3 RESIDENTIAL WELLS CURRENTLY TREATED BY CARBON FILTER - DEPICTS THE RESIDENCES AND BUSINESS WHERE EPA HAS INSTALLED A CARBON FILTER UNIT. A POTENTIALLY AFFECTED RESIDENCE (OR BUSINESS) IS LOCATED IN AN AREA THAT COULD BECOME CONTAMINATED AT UNACCEPTABLE LEVELS.

IN 1987, EPA MET WITH THE PRPS: CRYOCHEM, INC., C.S. GARBER & SONS, INC. AND PAST OWNERS AND OPERATORS OF CRYOCHEM, INC. AND THE CRYOCHEM, INC. PROPERTY. IN FEBRUARY 1988, EPA AND THE PRPS FOR THE SITE ENTERED INTO A CONSENT ORDER FOR THE PRPS TO CONDUCT A RI/FS AT THE SITE. THE

RI/FS WAS CONDUCTED PURSUANT TO A STATEMENT OF WORK THAT WAS ATTACHED TO THE CONSENT ORDER AND WAS COMPLETED IN JUNE 1990 UNDER THE SUPERVISION OF EPA. THE PURPOSE OF THE RI/FS WAS TO DETERMINE THE NATURE AND EXTENT OF CONTAMINATION AT THE SITE, TO ASSESS THE RISKS TO HUMAN HEALTH AND ENVIRONMENT POSED BY THE SITE, AND TO DEVELOP REMEDIAL ALTERNATIVES THAT WOULD ADDRESS THE RISKS POSED BY THE SITE.

TO SIMPLIFY AND EXPEDITE REMEDIAL ACTION AT THE SITE, EPA DIVIDED THE SITE INTO THREE MANAGEABLE COMPONENTS OR OPERABLE UNITS. THE THREE OPERABLE UNITS ARE:

1. OPERABLE UNIT 1 (OU1) - DRINKING WATER SUPPLY;
2. OPERABLE UNIT 2 (OU2) - AREA WIDE GROUND WATER; AND,
3. OPERABLE UNIT 3 (OU3) - SOURCE AREA (SOIL).

IN MAY 1991, A FOCUSED FEASIBILITY STUDY (FFS) ADDRESSING OPERABLE UNIT 3 WAS COMPLETED, EVALUATING ALTERNATIVES FOR REMEDIATING THE SOIL BEHIND THE FABRICATION BUILDING. THAT REPORT WAS THE BASIS FOR THE PROPOSED PLAN AND THIS ROD, BUT SOME REVISIONS HAVE OCCURRED.

#HCP

HIGHLIGHTS OF COMMUNITY PARTICIPATION

EPA HAS SEVERAL PUBLIC PARTICIPATION REQUIREMENTS WHICH ARE DESCRIBED IN SECTIONS 113(K)(2)(B), 117(A), AND 121(F)(1)(G) OF CERCLA 42 USC SS 9613(K)(2)(B), 9617(A) AND 9621(F)(1)(G).

THE PROPOSED PLAN FOR OU3 WAS RELEASED TO THE PUBLIC ON AUGUST 8, 1991. A COPY WAS MAILED TO EACH PRP AND ALSO TO LOCAL GOVERNMENT OFFICIALS. THE PROPOSED PLAN DEFINED A 30-DAY PERIOD DURING WHICH THE PUBLIC HAD THE OPPORTUNITY TO COMMENT ON THE PROPOSED PLAN AND THE REMEDIAL ALTERNATIVES CONSIDERED FOR OU3. THE 30-DAY PUBLIC COMMENT PERIOD PROVIDED IN THE PROPOSED PLAN STARTED AUGUST 8, 1991 AND ENDED SEPTEMBER 9, 1991.

ON AUGUST 8, 1991, EPA PUBLISHED A NOTICE OF AVAILABILITY OF THE PROPOSED PLAN AND ADMINISTRATIVE RECORD IN TWO LOCAL NEWSPAPERS. THE NOTICE WAS PUBLISHED IN THE READING TIMES/EAGLE AND IN THE BOYERTOWN TIMES.

THE PUBLIC WAS ENCOURAGED TO REVIEW THE PROPOSED PLAN AND ADMINISTRATIVE RECORD AND TO SUBMIT COMMENTS ON EPA'S PREFERRED REMEDIAL ALTERNATIVE. THE PUBLIC WAS GIVEN ADDITIONAL OPPORTUNITY TO COMMENT ON THE PROPOSED PLAN AT A PUBLIC MEETING HELD AT THE EARL TOWNSHIP BUILDING ON AUGUST 15, 1991. AT THIS MEETING REPRESENTATIVES FROM EPA ANSWERED QUESTIONS AND RECEIVED COMMENTS ABOUT THE SITE, THE REMEDIAL ALTERNATIVES UNDER CONSIDERATION, AND THE PREFERRED ALTERNATIVE. COMMUNITY RESPONSE TO THE PREFERRED ALTERNATIVE IS SUMMARIZED WITHIN THE "COMPARATIVE ANALYSIS OF ALTERNATIVES" SECTION OF THIS ROD. A STENOGRAPHIC REPORT OF THE PUBLIC MEETING WAS PREPARED BY EPA. A RESPONSE TO COMMENTS RECEIVED DURING THE 30-DAY PUBLIC COMMENT PERIOD IS INCLUDED AS PART OF THIS ROD IN THE RESPONSIVENESS SUMMARY (APPENDIX A).

THE RI REPORT AND THE FS REPORTS ARE INCLUDED IN THE ADMINISTRATIVE RECORD FOR THE SITE, LOCATED AT THE EARL TOWNSHIP BUILDING IN AUGUST 1991. THE ADMINISTRATIVE RECORD CONTAINS DOCUMENTS THAT SERVED AS THE BASIS FOR EPA'S SELECTION OF REMEDIAL ALTERNATIVES FOR THE SITE. THE AVAILABILITY OF THESE DOCUMENTS WAS STATED IN THE PROPOSED PLAN.

THE INDEX FOR THE ADMINISTRATIVE RECORD IS CONTAINED WITHIN APPENDIX B. THIS DECISION DOCUMENT IS ALSO BASED UPON COMMENTS CONTAINED WITHIN A STENOGRAPHIC REPORT OF THE PUBLIC MEETING ON AUGUST 15, 1991 AND OTHER COMMENTS RECEIVED BY EPA DURING THE 30-DAY PUBLIC COMMENT PERIOD, WHICH ARE INCLUDED IN THE SITE FILE MAINTAINED AT EPA. THE STENOGRAPHIC REPORT AND COMMENTS

WILL BE ADDED TO THE ADMINISTRATIVE RECORD.

#SRR

SCOPE AND ROLE OF OPERABLE UNIT 3

AS DESCRIBED ABOVE, EPA HAS DIVIDED THE CRYOCHEM SITE INTO THREE MANAGEABLE COMPONENTS OR OPERABLE UNITS. THE THREE OPERABLE UNITS ARE:

1. OPERABLE UNIT 1 (OU1) - DRINKING WATER SUPPLY;
2. OPERABLE UNIT 2 (OU2) - AREA WIDE GROUND WATER; AND,
3. OPERABLE UNIT 3 (OU3) - SOURCE AREA (SOIL).

THIS ROD ADDRESSES OU3, WHICH IS THE FINAL RESPONSE ACTION FOR THE SITE. THERE ARE NO PRINCIPAL THREATS ASSOCIATED WITH OU3.

THE ELEVATED LEVELS OF CONTAMINANTS DETECTED IN SOIL BEHIND THE FABRICATION BUILDING INDICATE THAT SOLVENT SPILLED ONTO THE GROUND BEHIND THE FABRICATION BUILDING MAY HAVE CONTRIBUTED TO GROUND WATER CONTAMINATION AT THE SITE. CONTAMINATED SOIL CONTINUES TO CONTRIBUTE TO THE THREAT POSED BY THE SITE SINCE CONTAMINANTS CONTINUE TO LEACH FROM THE SOIL INTO THE GROUND WATER SYSTEM. ALTHOUGH THE CONCENTRATIONS OF CONTAMINANTS IN THE SOIL WERE PROBABLY MUCH HIGHER THAN THOSE CURRENTLY DETECTED, EPA INTENDS TO REDUCE THE REMAINING CONTAMINANTS, IN ORDER TO MINIMIZE THE THREAT TO THE GROUND WATER FROM THE CONTAMINATED SOIL.

EXPOSURE TO THE CONTAMINATED GROUND WATER, WHICH IS THE DRINKING WATER SUPPLY IN THE AREA, IS THE PRIMARY RISK POSED BY THE SITE SINCE CONTAMINANTS ARE INGESTED VIA DRINKING WATER WELLS AND INHALED THROUGH DOMESTIC USE OF CONTAMINATED WATER. THE REMEDIAL ACTION FOR OU1-DRINKING WATER IS NOW IN THE REMEDIAL DESIGN STAGE WHICH MEANS THAT EPA IS DEVELOPING SPECIFIC PLANS FOR IMPLEMENTATION OF A CLEAN DRINKING WATER SUPPLY REMEDY. THE REMEDY FOR OU1-DRINKING WATER IS DETAILED IN THE ROD FOR OU1 PREPARED BY EPA IN SEPTEMBER 1989.

WITH EPA OVERSIGHT, THE POTENTIALLY RESPONSIBLE PARTIES ANALYZED AREA-WIDE GROUND WATER (OU2) UNDER A STUDY COMPLETED IN JUNE 1990. THIS STUDY DETERMINED THAT THE CONTAMINATED GROUND WATER BENEATH THE SITE SHOULD BE EXTRACTED, TREATED BY A PROCESS CALLED AIR STRIPPING, AND DISCHARGED TO A STREAM NEAR THE SITE. IN AIR STRIPPING A MIXTURE OF AIR AND CONTAMINATED WATER IS FORCED THROUGH A TOWER CONCURRENTLY, CAUSING THE CONTAMINANTS TO MOVE FROM THE WATER TO THE AIR, WHERE TOTAL ORGANIC EMISSIONS WILL BE LESS THAN 10 PPM BY WEIGHT. THIS REMEDY IS DESCRIBED IN DETAIL IN A RECORD OF DECISION PREPARED BY EPA IN SEPTEMBER 1990. EPA IS CURRENTLY PREPARING PLANS TO LOCATE AND SIZE THE TREATMENT SYSTEM FOR THE GROUND WATER APPROPRIATELY.

IN THE RECORD OF DECISION FOR OU2, EPA DECIDED THAT THE GROUND WATER SHOULD BE REMEDIATED TO MAXIMUM CONTAMINANT LEVELS, NON-ZERO MAXIMUM CONTAMINANT LEVEL GOALS, OR BACKGROUND, WHICHEVER IS LOWEST. TO THE EXTENT PRACTICABLE, OU3 WILL REMEDIATE THE REMAINING SOURCE OF GROUND WATER CONTAMINATION TO A DEGREE WHICH IS CONSISTENT WITH THE GOALS OF THE REMEDY FOR OU2.

#SSC

SUMMARY OF SITE CHARACTERISTICS

THE RI/FS WAS CONDUCTED TO DETERMINE THE EXTENT AND NATURE OF CONTAMINATION AT THE SITE. THE RESULTS OF THE RI ARE DISCUSSED IN THIS SECTION.

DURING FORMER OPERATIONS AT THE CRYOCHEM, INC. PLANT, A SOLVENT CONTAINING TCA WAS USED TO CLEAN

DYE FROM METAL WELDS. THE AMOUNT OF SOLVENT REPORTEDLY USED BETWEEN 1970 AND 1982 WAS APPROXIMATELY THREE 55-GALLON DRUMS PER YEAR. CRYOCHEM, INC. ALSO REPORTED THAT A SPILL OF AN UNKNOWN AMOUNT OF SOLVENT FROM A 55-GALLON DRUM OCCURRED AT SOME UNSPECIFIED TIME IN THE PAST. SPILLED SOLVENT WOULD HAVE COLLECTED IN THE SHOP DRAINS AND FLOWED, THROUGH UNDERGROUND PIPES, INTO A SMALL STREAM LOCATED ALONG THE WESTERN EDGE OF THE CRYOCHEM, INC. PROPERTY.

DURING THE RI, THE SUMP INTO WHICH THE SOLVENT SPILL REPORTEDLY OCCURRED WAS EXAMINED, HYDRAULICALLY TESTED, AND DETERMINED TO BE INTACT. THE PIPES THROUGH WHICH THE SOLVENT WOULD HAVE FLOWED INTO THE ON-SITE STREAM WERE ALSO EXAMINED, HYDRAULICALLY TESTED, AND DETERMINED TO BE INTACT. THUS, IT REMAINS UNCLEAR IF THE REPORTED SPILL OF SOLVENT CAUSED GROUND WATER CONTAMINATION AT THE SITE. THE APPROXIMATE EXTENT OF GROUND WATER CONTAMINATION IS DEPICTED ON FIGURE 4 EXTENT OF GROUND WATER CONTAMINATION.

THE DESIGN SPECIFICATIONS AND CRITERIA OF ANY GROUND WATER REMEDIATION SYSTEM TO BE CONSTRUCTED AT THE SITE WOULD BE BASED, IN PART, UPON THE LOCATION OF CONTAMINATED SOIL AND THE TYPE AND AMOUNT OF CONTAMINANTS IDENTIFIED WITHIN THE SOIL. FOR EXAMPLE, THE EXTRACTION WELLS WOULD BE LOCATED TO ENSURE THAT CONTAMINANTS LEACHING FROM THE SOIL INTO GROUND WATER WOULD BE COLLECTED BY THE EXTRACTION WELLS.

A SOIL GAS SURVEY WAS PERFORMED OVER AREAS SUSPECTED OF CONTRIBUTING TO THE VOLATILE ORGANIC GROUND WATER CONTAMINATION IN THE AREA. THE SOIL GAS SURVEY WAS USED AS A SCREENING TOOL AND CORRELATED WITH SITE HISTORIES TO IDENTIFY SURFACE SOIL SAMPLE LOCATION. THE SOIL GAS SURVEY FOCUSED ON SIX AREAS OF POTENTIAL SOIL CONTAMINATION:

- 1) CRYOCHEM, INC. AND C.S. GARBER PROPERTIES
- 2) FANCYHILL MOBIL STATION
- 3) R AND R GARBER, ISC, AND KEEN ELECTRIC PROPERTIES
- 4) CRYOCHEM, INC. FORMER GRAVEL PIT
- 5) TREXLER PROPERTY
- 6) HEIMBACH DUMP SITE AT THE WILLING'S PROPERTY

SOIL VAPOR SAMPLES WERE ANALYZED AT 181 LOCATIONS OVER FIVE MONTHS THROUGHOUT THE SURVEY AREA. THE SOIL PROBE WAS DRIVEN THREE FEET INTO THE SOIL WHERE POSSIBLE. OCCASIONALLY, THE PROBE COULD NOT BE DRIVEN THREE FEET DEEP DUE TO SHALLOW BEDROCK OR GROUND WATER. FOR EXAMPLE, SHALLOW BEDROCK AND GROUND WATER BEHIND THE FABRICATION BUILDING PRECLUDED THE PROBE FROM BEING DRIVEN DEEPER THAN TWENTY INCHES. SAMPLES WERE COLLECTED AT SHALLOWER DEPTHS IN THESE PARTICULAR CASES. SOIL VAPOR SAMPLES WERE MEASURED WITHIN THE CRYOCHEM, INC. FABRICATION BUILDING BY DRILLING HOLES THROUGH THE CONCRETE FLOOR OF THE PLANT.

THE MOST SIGNIFICANT READINGS OBSERVED DURING THE SOIL GAS SURVEY WERE AROUND AND BELOW THE CRYOCHEM, INC. PLANT. OTHER SIGNIFICANT READINGS WERE MEASURED AT C.S. GARBER, ISC, FANCYHILL MOBIL STATION, R AND R GARBER, AND THE GARBER ESTATE. THESE HIGHER SOIL GAS READINGS WERE CONSIDERED IN SELECTING LOCATIONS FOR OBTAINING SURFACE SOIL SAMPLES. MOISTURE AFFECTED THE SURVEY INSTRUMENT THROUGHOUT THE SOIL GAS SURVEY. THIS EFFECT IS BELIEVED TO BE THE CAUSE OF SOIL GAS READINGS AT LOCATIONS WHERE LABORATORY ANALYSIS OF SOIL SAMPLES DID NOT DETECT SIGNIFICANT VOLATILE ORGANIC SOIL CONTAMINANTS.

SOIL GAS SURVEY DATA WERE CORRECTED FOR CALIBRATION VARIABILITY AND INSTRUMENT DRIFT BY SUBTRACTING AMBIENT AIR READINGS MEASURED AT EACH SAMPLE LOCATION FROM DIRECT READINGS. AFTER REVIEWING CORRECTED DATA, VALUES OF 40 (NO UNITS) AND ABOVE WERE CHOSEN TO REPRESENT POSSIBLE CONTAMINANT SOURCES. THIS VALUE REPRESENTS SIGNIFICANT DCA AND TCA CONCENTRATIONS (APPROXIMATELY 100 PPM AND 70 PPM, RESPECTIVELY) AND RELATIVELY LOW CONCENTRATIONS OF DCE, TCE, AND PCE (APPROXIMATELY 3-5 PPM) BASED ON THE RELATIVE RESPONSE OF EACH COMPOUND. ALSO THE DIFFERENCE IN THE RESULTS OF SAMPLE ANALYSES CONDUCTED WITH AND WITHOUT THE DESICCANT WAS WITHIN

A VALUE OF 40 FOR THE MAJORITY OF THE SAMPLES (APPROXIMATELY 72 PERCENT). THE ANALYSES THAT HAD DIFFERENCES EXCEEDING A VALUE OF 40 HAD HIGH DIRECT READINGS (W/O DESICCANT) WHICH WERE INCLUDED IN INTERPRETING RESULTS.

SURFACE SOIL SAMPLES WERE COLLECTED FROM FOUR OF THE SIX AREAS (1) INVESTIGATED DURING THE SOIL GAS SURVEY, NOTED BELOW:

- 1) CRYOCHEM, INC. AND C.S. GARBER
- 2) FANCYHILL MOBIL STATION
- 3) R AND R GARBER, ISC, AND KEEN ELECTRIC
- 4) HEIMBACH DUMP

(1) NEITHER THE CRYOCHEM, INC. FORMER GRAVEL PIT NOR THE TREXLER PROPERTY WERE FOUND TO BE POSSIBLE CONTAMINANT SOURCES.

NINETEEN SAMPLE LOCATIONS WERE CHOSEN BASED ON SITE HISTORIES, SITE CHARACTERISTICS, AND THE RESULTS OF THE SOIL GAS SURVEY. THE 19 SAMPLES WERE COLLECTED FROM A DEPTH NO GREATER THAN 36 INCHES.

DURING THE RI AND DURING PREVIOUS INVESTIGATION, VOCs WERE DETECTED IN SOIL SAMPLES COLLECTED AT THE SITE. THE HIGHEST CONCENTRATIONS WERE DETECTED IN A SAMPLE COLLECTED FROM A DEPTH OF 9 TO 12 INCHES BEHIND THE FABRICATION BUILDING. THE LEVELS OF CONTAMINANTS FOUND IN SOIL SAMPLES ARE DEPICTED IN TABLE 1 SUMMARY OF SURFACE SOIL SAMPLE ANALYSES.

THE ELEVATED LEVELS OF CONTAMINANTS DETECTED IN SOIL NEAR THE FABRICATION BUILDING INDICATE THAT SOLVENT SPILLED BEHIND THE FABRICATION BUILDING MOST LIKELY CONTRIBUTED TO GROUND WATER CONTAMINATION AT THE SITE. THE ELEVATED CONCENTRATIONS OF XYLENE AND ETHYLBENZENE IN SOIL SAMPLE #17 MOST LIKELY RESULTED FROM MINOR SPILLS OF FUEL DURING REFILLING OF THE FUEL TANK LOCATED NEAR THE BACK DOOR. (SEE FIGURES 5 AND 6 APPROXIMATE AREA OF SOIL CONTAMINATION.)

THE BEDROCK BENEATH THE SITE CONSISTS OF FRACTURED QUARTZITE (HARDYSTON FORMATION) AND CRYSTALLINE LIMESTONE (LEITHSVILLE FORMATION) overlain BY SOIL DERIVED FROM WEATHERED BEDROCK (OVERBURDEN) (SEE FIGURE 7 GEOLOGIC MAP, AND FIGURE 8 GEOLOGIC CROSS SECTION). A FRACTURE CAN BE CONSIDERED TO BE ANY BREAK IN THE ROCK MATRIX. GROUND WATER MOVES PREDOMINANTLY THROUGH THE FRACTURE SYSTEM AND THROUGH SOLUTION CAVITIES FORMED WHEN CERTAIN MINERALS IN THE BEDROCK DISSOLVE OR WEATHER FROM THE ROCK MATRIX OVER TIME. THEREFORE, RESIDENTIAL OR OTHER WELLS PENETRATING THE SAME FRACTURES OR FRACTURE SYSTEMS CONTAINING GROUND WATER CONTAMINATED FROM THE SITE MAY THEMSELVES BECOME CONTAMINATED. SOME RESIDENTIAL WELLS ARE CONTAMINATED BY THE SAME VOCs AS THOSE FOUND IN GROUND WATER BENEATH THE SITE AND IN SOIL BEHIND CRYOCHEM, INC.'S FABRICATION BUILDING.

A LARGE FAULT, WHICH IS A FRACTURE ALONG WHICH TWO SEPARATE BLOCKS OF THE BEDROCK HAVE MOVED, EXISTS SOUTH OF THE SITE. THE FAULT IS SIGNIFICANT IN THAT IT SEPARATES CRYSTALLINE LIMESTONE, WHICH IS ALSO BENEATH THE SITE, FROM RED SHALE. AS GROUND WATER MOVES TOWARDS THE FAULT IT MAY MOVE UPWARD AND DISCHARGE AT THE SURFACE IN THE FORM OF SPRINGS. SIMPLIFIED, GROUND WATER DISCHARGES AS SPRINGS SINCE IT IS EASIER FOR GROUND WATER TO MOVE UP THE FAULT THAN IT IS FOR IT TO MOVE INTO THE RED SHALE.

DURING THE RI, SEVERAL GROUND WATER MONITORING WELLS WERE INSTALLED AT AND NEAR THE SITE (FIGURE 9 LOCATIONS OF GROUND WATER MONITORING WELLS). THE MAIN OBJECTIVE OF INSTALLING MONITORING WELLS WAS TO DETERMINE THE EXTENT OF GROUND WATER CONTAMINATION. WELLS WERE INSTALLED IN CLUSTERS, (I.E., A SHALLOW WELL WAS INSTALLED ADJACENT TO A DEEP WELL), FOR THE PURPOSE OF DETERMINING IF THE CONTAMINATION WAS CONFINED TO SHALLOW ZONES OR HAD SPREAD DEEPER INTO THE GROUND WATER SYSTEM. SINCE GROUND WATER TENDS TO MIGRATE IN DISCRETE ZONES, SUCH AS A DEEP FRACTURE, THE

MONITORING WELLS WERE CONSTRUCTED TO ALLOW A SAMPLE TO BE COLLECTED FROM EITHER THE SHALLOW OR DEEP ZONE. THE SAMPLING RESULTS FROM THESE WELLS SUGGEST THAT THE CONTAMINATION IS NOT CONFINED TO SHALLOW GROUND WATER ZONES SINCE BOTH SHALLOW AND DEEP MONITORING WELLS CONTAINED CONTAMINANTS. HOWEVER, THE CONCENTRATIONS OF CONTAMINANTS IN THE SHALLOW GROUND WATER SAMPLES ARE TYPICALLY HIGHER THAN THE CONCENTRATIONS IN THE DEEPER SAMPLES SUGGESTING THAT CONTAMINANTS MAY NOT HAVE SUNK TO THE BOTTOM OF THE GROUND WATER SYSTEM. NO VINYL CHLORIDE, WHICH IS A DEGRADATION PRODUCT OF TCE AND A KNOWN HUMAN CARCINOGEN, HAS BEEN DETECTED IN THE RESIDENTIAL WELLS OR MONITORING WELLS.

THE RESULTS OF GROUND WATER SAMPLING DURING THE RI INDICATE THAT THE AREA OF GROUND WATER CONTAMINATION EXTENDS FROM THE CRYOCHEM, INC. FACILITY NEARLY 2500 FEET SOUTHEAST TO SEVERAL SPRINGS LOCATED ALONG THE TRIBUTARY TO IRONSTONE CREEK (NEAR TROUT FARM). BASED UPON THE RESULTS OF THE RI, THE PLUME OF CONTAMINATED GROUND WATER MAY EXTEND FURTHER SOUTH THAN THESE SPRINGS. HOWEVER, THE PRESENCE OF THE FAULT AND THE LARGE SPRINGS NEAR THE TROUT FARM SUGGEST THAT GROUND WATER IS DISCHARGING TO SURFACE WATER AT THE SPRINGS LOCATED ALONG THE TRIBUTARY TO IRONSTONE CREEK. TYPICALLY HIGH ELEVATION AREAS, E.G., SAND HILL OR FANCY HILL, ARE AREAS WHERE GROUND WATER IS RECHARGED BY PRECIPITATION. IN RECHARGE AREAS, GROUND WATER TYPICALLY MOVES FROM HIGH ELEVATION TO LOW ELEVATION, OR DOWNWARD. GROUND WATER EVENTUALLY MOVES TOWARDS LOW-LYING AREAS, E.G., SWAMPS AND STREAMS, AND THEN MAY MOVE UPWARD TO DISCHARGE INTO SURFACE WATER. THE PRESENCE OF SPRINGS CAN BE AN INDICATION THAT GROUND WATER IS MOVING UPWARD TO THE GROUND SURFACE.

THE LATERAL DIMENSIONS OF THE PLUME OF CONTAMINATED GROUND WATER ARE NOT FULLY DEFINED IN THE AREAS SOUTHEAST OF FANCY HILL AVENUE. HOWEVER, THE RESULTS OF RESIDENTIAL WELL SAMPLING AND THE DISTRIBUTION OF CONTAMINANTS IN SURFACE WATER AND GROUND WATER NEAR THE TROUT FARM INDICATE THAT THE PLUME CONTINUES TO MOVE SOUTHEASTERLY FROM FANCY HILL AVENUE, WHERE IT IS DEFINED BY RESIDENTIAL WELL SAMPLING, TO THE SPRINGS NEAR THE TROUT FARM. THE VOLUME OF CONTAMINATED GROUND WATER IS ESTIMATED TO BE NEARLY 1.5 BILLION GALLONS ASSUMING A UNIFORM DEPTH OF CONTAMINATION OF 300 FEET AND MINIMAL LATERAL DISPERSION OF THE PLUME.

SINCE CONTAMINATED GROUND WATER DISCHARGES TO STREAMS ON AND NEAR THE SITE (I.E., INTO THE ON-SITE STREAM AND INTO THE STREAM NEAR THE TROUT FARM), SURFACE WATER NEAR THE SITE IS ALSO CONTAMINATED. THE LEVEL OF CONTAMINATION WITHIN THE SURFACE WATER QUICKLY DISSIPATES DOWNSTREAM FROM THE AREA WHERE CONTAMINATED GROUND WATER INTRODUCES THE CONTAMINANTS INTO THE SURFACE WATER. CONTAMINANT LEVELS IN THE SURFACE WATER ARE MOST LIKELY REDUCED BY VOLATILIZATION AND DILUTION. THE CONTAMINATED SURFACE WATER IS LIMITED TO THE ON-SITE STREAM AND TO THE AREA IMMEDIATELY DOWNSTREAM OF THE SPRINGS AT THE SOUTHERN EXTENT OF THE PLUME.

THE RI RESULTS ALSO SUGGEST THAT A POTENTIAL SOURCE OF GROUND WATER CONTAMINATION EXISTS SOMEWHERE NORTH OF THE SITE. SEVERAL RESIDENTIAL WELLS LOCATED NORTH OF THE SITE CONTAINED THE HIGHEST LEVELS OF TCE DETECTED (3 SAMPLES, 18 PPB TO 77 PPB) IN THE GROUND WATER. SINCE GROUND WATER IN THE AREA GENERALLY FLOWS FROM NORTH TO SOUTH, GROUND WATER CONTAMINATED BY TCE FROM AN OFF-SITE SOURCE NORTH OF CRYOCHEM, INC. MAY HAVE MIGRATED ONTO, AND MAY CONTINUE TO MIGRATE ONTO, THE SITE. TCE WAS DETECTED AT HIGH CONCENTRATIONS IN HOMES NORTH OF THE SITE.

A WETLAND AREA WAS IDENTIFIED AT THE SITE. THE WETLAND AREA IS UPSTREAM OF THE AREA WHICH HAS BEEN IDENTIFIED AS THE SOURCE OF THE SITE-RELATED GROUND WATER AND SURFACE WATER CONTAMINATION AND THEREFORE IS MOST LIKELY NOT IMPACTED BY THE SITE-RELATED CONTAMINATION. ONE OBLIGATE WETLAND SPECIES, THE COMMON CATTAIL, WAS IDENTIFIED IN THE WETLAND AREA. NO OTHER WETLAND AREAS, EXCEPT THE STREAM ITSELF, WERE IDENTIFIED.

APPENDIX C CONTAINS A SUMMARY OF ALL SAMPLING DATA COLLECTED DURING THE RI/FS.

#SSR

SUMMARY OF SITE RISKS

DURING THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY, A BASELINE RISK ASSESSMENT WAS CONDUCTED WHICH QUANTIFIED THE RISKS POSED BY THE SITE IF NO RESPONSE ACTION WERE TAKEN TO ADDRESS SITE-RELATED CONTAMINATION. BOTH EPA AND JACA CORPORATION (ON BEHALF OF THE PRPS) CONDUCTED A BASELINE RISK ASSESSMENT. THE FOCUS OF EACH RISK ASSESSMENT WAS TO DETERMINE HEALTH EFFECTS THAT WOULD RESULT FROM EXPOSURE TO THE CONTAMINANTS OF CONCERN ASSOCIATED WITH THE SITE. THE RESULTS OF EPA'S ASSESSMENT WERE CONSIDERED PREVIOUSLY, AND EPA'S RESULTS ARE CONSISTENT WITH RESULTS OBTAINED BY JACA CORPORATION ON BEHALF OF THE PRPS.

RESIDENTIAL DRINKING WATER WAS SAMPLED TWICE DURING THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY BY THE POTENTIAL RESPONSIBLE PARTIES AND MANY TIMES BY EPA. RESIDENTIAL USE OF GROUND WATER FROM 14 RESIDENTIAL WELLS NEAR THE SITE COULD RESULT IN AN UPPERBOUND EXCESS LIFETIME CANCER RISK OF 1×10^{-2} .

THIS CANCER RISK LEVEL MEANS THAT IF THE GROUND WATER WERE NOT CLEANED, OR AN ALTERNATE WATER SUPPLY WERE NOT PROVIDED, AND RESIDENTS CONTINUED TO USE CONTAMINATED GROUND WATER, NOT MORE THAN ONE ADDITIONAL PERSON PER ONE HUNDRED PEOPLE COULD CONTRACT CANCER DUE TO EXPOSURE VIA INGESTION AND INHALATION. THIS RISK IS IN ADDITION TO THE RISK POSED BY ALL OTHER SOURCES, E.G., A 30,000 CHANCE OUT OF 1,000,000 OF CONTRACTING CANCER FROM SMOKING. THE NCP STATES THAT AN ACCEPTABLE RISK RANGE IS BETWEEN 1×10^{-4} (1 IN 10,000 OR 100 IN 1,000,000) AND 1×10^{-6} (1 IN 1,000,000). HOWEVER, EPA STRIVES TO REDUCE RISK TO THE 1×10^{-6} LEVEL AND THUS USES THIS LEVEL AS THE POINT OF DEPARTURE WHEN IT CONSIDERS A SITE REMEDY.

OTHER RISKS POSED BY THE SITE RESULT FROM POTENTIAL EXPOSURES VIA INCIDENTAL INGESTION OF SURFACE WATER, DERMAL CONTACT WITH SURFACE WATER, AND FISH INGESTION. TABLE 2 SUMMARY OF EXPOSURE PATHWAYS IDENTIFIES THE EXPOSURE PATHWAYS ASSOCIATED WITH THE AFFECTED MEDIA IDENTIFIED ABOVE.

THESE RISKS ARE, HOWEVER, MUCH LESS THAN THOSE ASSOCIATED WITH RESIDENTIAL USE OF CONTAMINATED GROUND WATER. THE RISK TO CHILDREN AND ADULTS FROM ALL EXPOSURE PATHWAYS COMBINED IS 1×10^{-2} (1 ADDITIONAL PERSON PER 1 HUNDRED PEOPLE). THE RISK ESTIMATES ARE CALCULATED USING VARIOUS CONSERVATIVE ASSUMPTIONS ABOUT THE LIKELIHOOD OF EXPOSURE, THE AMOUNT OF EXPOSURE, AND THE TOXICITY OF THE CHEMICALS. THE ASSESSMENT OF RISK INVOLVES MANY ASSUMPTIONS ABOUT THE AMOUNT OF EXPOSURE TO CONTAMINANTS. EPA STRIVES TO SELECT PROTECTIVE REMEDIES AND THUS UTILIZES RISK ESTIMATING ASSUMPTIONS THAT ARE SOMEWHAT CONSERVATIVE, E.G., EPA USES THE UPPER BOUND ESTIMATES OF THE MEAN VALUES OF CERTAIN PARAMETERS AND THE 90TH PERCENTILE FOR OTHERS. FOR EXAMPLE, EPA ASSUMES THAT AN INDIVIDUAL LIVES AT THE SAME RESIDENCE FOR 30 YEARS DURING WHICH HE IS EXPOSED TO CONTAMINANT LEVELS EQUAL TO THE UPPER CONFIDENCE LEVEL OF THE MEAN. TABLE 3 EXPOSURE ASSESSMENT ASSUMPTIONS - LISTS EACH OF THE ASSUMPTIONS EPA USED TO CALCULATE EXPOSURE TO CONTAMINANTS OF CONCERN AT THE SITE. THE EXPOSURE SCENARIO, WHICH IS DEVELOPED USING THE ASSUMPTIONS IDENTIFIED BELOW, IS A REASONABLE MAXIMUM EXPOSURE SCENARIO.

CHEMICAL INTAKES ARE CALCULATED BY COMBINING THE AMOUNT OF CHEMICAL (EACH CONTAMINANT OF CONCERN) WITH THE DURATION OF THE EXPOSURE TO THE CONTAMINATED ENVIRONMENTAL MEDIA.

THE CHEMICALS DESCRIBED BELOW WERE FOUND IN THE SOIL BEHIND THE FABRICATION BUILDING, AND WERE CONSIDERED DURING THE RISK ASSESSMENT:

1,1,1-TRICHLOROETHANE. INHALATION EXPOSURE TO HIGH CONCENTRATIONS OF 1,1,1-TRICHLOROETHANE DEPRESSES THE CENTRAL NERVOUS SYSTEM, ALTERS CARDIOVASCULAR FUNCTION, AND DAMAGES THE LUNGS, LIVER, AND KIDNEYS IN ANIMALS AND HUMANS. IRRITATION OF THE SKIN AND MUCOUS MEMBRANES IS ALSO

ASSOCIATED WITH HUMAN EXPOSURE TO 1,1,1-TCA.

1,1-DICHLOROETHANE. BASED ON LIMITED EVIDENCE OF CARCINOGENICITY IN TWO ANIMAL SPECIES (RATS AND MICE), EPA CONSIDERS 1,1-DICHLOROETHANE TO BE A CLASS C POSSIBLE HUMAN CARCINOGEN. INHALATION EXPOSURE CAUSES HEADACHE, DIZZINESS, NAUSEA, VOMITING, ABDOMINAL PAIN, IRRITATION OF MUCOUS MEMBRANES, AND LIVER AND KIDNEY DAMAGE. DERMAL EXPOSURE MAY CAUSE DERMATITIS.

TETRACHLOROETHENE. EPA CONSIDERS TETRACHLOROETHENE (PCE) A CLASS B2 PROBABLE HUMAN CARCINOGEN, BASED ON EVIDENCE THAT PCE CAUSES LIVER TUMORS WHEN ADMINISTERED ORALLY TO MICE. NON-CANCER EFFECTS CAUSED BY PCE IN ANIMALS INCLUDE NEUROLOGICAL DEPRESSION, INCREASED LIVER WEIGHT/BODY WEIGHT RATIOS, DECREASED BODY WEIGHT, INCREASED LIVER TRIGLYCERIDES, DECREASED DNA CONTENT OF CELLS, ALTERED LIVER ENZYME ACTIVITY, NECROSIS, DEGENERATION AND POLYPOIDY. THE ONLY TOXIC EFFECT DOCUMENTED IN HUMANS IS OLFACTORY DESENSITIZATION.

TRICHLOROETHENE. EPA CONSIDERS TRICHLOROETHENE (TCE) A CLASS B2 PROBABLE HUMAN CARCINOGEN, BASED ON TUMORS REPORTED IN TWO STRAINS OF MICE EXPOSED TO TCE BY TWO ROUTES, AND IN MALE RATS EXPOSED ORALLY. TCE PRODUCES MUTATIONS AND UNSCHEDULED DNA SYNTHESIS IN BACTERIA AND MOUSE CELLS, EVIDENCE WHICH SUPPORTS THE B2 CLASSIFICATION. TCE ALSO AFFECTS BONE MARROW, CENTRAL NERVOUS SYSTEM, LIVER, AND KIDNEY IN ANIMALS AND HUMANS. NON-CANCER EFFECTS INCLUDE NARCOSIS, ENLARGEMENT OF LIVER AND KIDNEY WITH ACCOMPANYING ENZYME CHANGES, DEPRESSED HEME SYNTHESIS, AND IMMUNO-SUPPRESSION.

ETHYLBENZENE. ETHYLBENZENE IS A SKIN AND EYE IRRITANT. THERE IS SOME EVIDENCE SUGGESTING THAT IT CAUSES ADVERSE REPRODUCTIVE EFFECTS IN ANIMALS. ORAL AND INHALATION EXPOSURE CAUSES MINOR LIVER AND KIDNEY CHANGES IN RATS.

XYLENE. XYLENE IS TOXIC TO FETUSES IN RATS AND MICE; IN HUMANS, EXPOSURE TO HIGH LEVELS ADVERSELY AFFECTS THE CENTRAL NERVOUS SYSTEM AND IRRITATES MUCOUS MEMBRANES. XYLENE HAS NOT BEEN FOUND TO BE EITHER A MUTAGEN OR CARCINOGEN.

CURRENT AND POTENTIAL FUTURE EXPOSURE SCENARIOS WERE EVALUATED IN THE RISK ASSESSMENT. SINCE RESIDENTIAL WELLS THAT ARE AFFECTED ARE EQUIPPED WITH CARBON FILTERS, INGESTION OF CONTAMINATED GROUND WATER WAS CONSIDERED TO BE A POTENTIAL FUTURE EXPOSURE. FOR EXAMPLE, AN INDIVIDUAL COULD BE EXPOSED IF A NEW WELL WAS DRILLED INTO THE CONTAMINATED AREA OR IF THE EXISTING FILTER UNITS WERE NOT PROPERLY MAINTAINED. THUS, THE ESTIMATES ARE BASED UPON LEVELS OF CONTAMINANTS IN UNTREATED WATER. FUTURE USE SCENARIOS ALSO ASSUME THAT CURRENT EXPOSURES CONTINUE INTO THE FUTURE, I.E., NO REMEDIATION OCCURS. CURRENT EXPOSURE SCENARIOS INCLUDE INCIDENTAL INGESTION OF SURFACE WATER WHILE PLAYING IN THE CONTAMINATED STREAM, DERMAL (SKIN) CONTACT WITH SURFACE WATER WHILE PLAYING IN THE STREAM, INCIDENTAL INGESTION OF SOIL BY A CHILD WHO TRESPASSES BEHIND CRYOCHEM, INC.'S FABRICATION BUILDING, AND INGESTION OF FISH CAUGHT IN THE CONTAMINATED STREAM. DERMAL CONTACT WITH CONTAMINATED SOIL BY CRYOCHEM INC. WORKERS AND INHALATION OF CONTAMINANTS FROM SOIL BY CRYOCHEM, INC. WORKERS ARE POTENTIAL EXPOSURE PATHWAYS, BUT WERE NOT EVALUATED BY EPA SINCE THE RISK IS EXPECTED TO BE MINIMAL, I.E., LESS THAN 1×10^{-6} . JACA EVALUATED EXPOSURE TO CRYOCHEM, INC. WORKERS AND DETERMINED THAT EXPOSURES FROM CONTAMINATED SOIL WERE WELL BELOW (SAFER THAN) ACCEPTABLE RISK-BASED LEVELS. THERE IS NO SIGNIFICANT RISK FROM DIRECT CONTACT WITH THE SOIL.

CANCER POTENCY FACTORS (CPFS) HAVE BEEN DEVELOPED BY EPA'S CARCINOGEN RISK ASSESSMENT VERIFICATION ENDEAVOR (CRAVE) FOR ESTIMATING EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC (CANCER-CAUSING) CHEMICALS. CPFS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY)⁽⁻¹⁾, ARE MULTIPLIED BY THE ESTIMATED CHEMICAL INTAKE OF A POTENTIAL CARCINOGEN, IN MG/KG-DAY, TO PROVIDE AN UPPER BOUND ESTIMATE OF THE EXCESS LIFETIME CANCER RISK ASSOCIATED WITH THE EXPOSURE AT THAT INTAKE LEVEL. THE TERM "UPPER BOUND" REFLECTS THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE CPF. USE OF THIS APPROACH MAKES UNDERESTIMATION OF THE ACTUAL CANCER RISK HIGHLY UNLIKELY. CPFS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED. CPFS FOR THE CONTAMINANTS OF CONCERN ARE SHOWN IN TABLE 4.

REFERENCE DOSES (RFDs) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM EXPOSURE TO CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS. RFDs, WHICH ARE EXPRESSED IN UNITS OF MG/KG-DAY, ARE ESTIMATES OF LIFETIME DAILY EXPOSURE LEVELS FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS, WHICH ARE EXPECTED TO HAVE NO ADVERSE IMPACT. ESTIMATED INTAKES OF CHEMICALS FROM ENVIRONMENTAL MEDIA (E.G., THE AMOUNT OF CHEMICAL INGESTED FROM CONTAMINATED DRINKING WATER) CAN BE COMPARED TO THE RFD. RFDs ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL STUDIES OR ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED (E.G., TO ACCOUNT FOR THE USE OF ANIMAL DATA TO PREDICT EFFECTS ON HUMANS). THESE UNCERTAINTY FACTORS HELP TO ENSURE THAT THE RFDs WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC EFFECTS TO OCCUR. RFDs FOR THE CONTAMINANTS OF CONCERN ARE DEPICTED IN TABLE 4.

EXCESS LIFETIME CANCER RISKS ARE DETERMINED BY MULTIPLYING THE INTAKE LEVEL BY THE CPF. THESE RISKS ARE PROBABILITIES THAT ARE GENERALLY EXPRESSED IN SCIENTIFIC NOTATION (E.G., $1 \times (10^{-6})$, OR 1 IN 1 MILLION). AN EXCESS LIFETIME CANCER RISK OF $1 \times (10^{-6})$ INDICATES THAT, AS A PLAUSIBLE UPPER BOUND, AN INDIVIDUAL HAS A ONE IN ONE MILLION CHANCE OF DEVELOPING CANCER AS A RESULT OF SITE-RELATED EXPOSURE TO A CARCINOGEN OVER HIS OR HER ENTIRE LIFETIME. EXCESS LIFETIME CANCER RISK ASSOCIATED WITH SITE-RELATED EXPOSURES ARE DEPICTED IN TABLES 5 - 7.

POTENTIAL CONCERN FOR NONCARCINOGENIC EFFECTS OF A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS A HAZARD QUOTIENT (OR THE RATIO OF THE ESTIMATED INTAKE DERIVED FROM THE CONTAMINANT CONCENTRATION IN A GIVEN MEDIUM TO THE RFD FOR THE CONTAMINANT). BY ADDING THE HAZARD QUOTIENTS FOR ALL CONTAMINANTS WITHIN A MEDIUM OR ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY BE EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR GAUGING THE POTENTIAL SIGNIFICANCE OF MULTIPLE CONTAMINANT EXPOSURES WITHIN A SINGLE MEDIUM OR ACROSS ALL MEDIA. AN HI GREATER THAN 1 SUGGESTS SOME INDIVIDUALS MAY BE EXPOSED TO NONCARCINOGENS AT LEVELS ABOVE "SAFE" LEVELS. THE HIs ASSOCIATED WITH SITE-RELATED EXPOSURES ARE DEPICTED IN TABLES 8 - 10.

BECAUSE RECEPTOR POPULATIONS COULD REASONABLY BE EXPOSED BY ALL THE EXPOSURE ROUTES EVALUATED, RISKS AND HAZARD INDEXES FROM EACH EXPOSURE ROUTE WERE COMBINED IN TABLES 7 AND 10. SINCE EXPOSURE TO MORE THAN ONE CHEMICAL COULD OCCUR THROUGH ANY OF THE EXPOSURE PATHWAYS, CARCINOGENIC RISKS AND HAZARD QUOTIENTS FOR EACH CHEMICAL WERE ADDED TO OBTAIN THE TOTAL RISK OR HI FOR EACH PARTICULAR EXPOSURE PATHWAY. CANCER RISKS TO CHILDREN AND ADULTS WERE ALSO COMBINED UNDER THE ASSUMPTION THAT CHILDREN RAISED NEAR THE SITE MIGHT CONTINUE TO LIVE THERE AS ADULTS. HAZARD INDEXES FOR CHILDREN AND ADULTS WERE NOT COMBINED BECAUSE THEY WERE BASED ON 1 YEAR, RATHER THAN LIFETIME, EXPOSURES.

THE TOTAL UPPER BOUND EXCESS LIFETIME CANCER RISK ASSOCIATED WITH THE FUTURE USE SCENARIO INCLUDING ALL CURRENT USE EXPOSURES WAS $1.23 \times (10^{-2})$, OR APPROXIMATELY 1 IN 100. THIS MEANS THAT FOR EVERY MILLION PEOPLE EXPOSED TO SITE-RELATED CONTAMINANTS, NO MORE THAN 10,000 COULD CONTRACT CANCER DUE TO THEIR EXPOSURE. THERE ARE SEVERAL IMPORTANT CAVEATS TO THIS ESTIMATE:

1. NEARLY ALL THE RISK WAS ASSOCIATED WITH RESIDENTIAL WELL WATER, WHICH IS CURRENTLY BEING TREATED WITH CARBON FILTER UNITS. THEREFORE, THIS EXPOSURE IS NOT PRESENTLY OCCURRING.

2. MOST OF THE RESIDENTIAL WELL RISK WAS ASSOCIATED WITH DCE WHICH IS A CLASS C CARCINOGEN. THIS CLASSIFICATION MEANS THAT ANIMAL TUMOR DATA FOR THIS COMPOUND ARE EQUIVOCAL. IT IS POSSIBLE THAT DCE IS NOT CARCINOGENIC IN HUMANS.

3. THE RISK ESTIMATE APPLIES ONLY TO THE MOST CONTAMINATED HOMES. CANCER RISKS AT THE OTHER HOMES WOULD PROBABLY BE LESS.

THE TOTAL HI ASSOCIATED WITH THE FUTURE USE SCENARIO WAS 1.47 FOR ADULTS AND 6.00 FOR CHILDREN. THIS RISK ORIGINATED ALMOST ENTIRELY FROM WELL WATER. THE HI FOR INHALATION MAY BE ARTIFICIALLY LOW SINCE INHALATION RFDS WERE NOT AVAILABLE FOR FOUR OF THE COMPOUNDS.

THE FOLLOWING FACTORS CONTRIBUTED ELEMENTS OF UNCERTAINTY IN THE RISK ASSESSMENT: 1) THE ACTUAL OR POTENTIAL USE OF THE CONTAMINATED STREAM FOR RECREATION, 2) LIMITED SAMPLE DATABASE FOR SOME MEDIA (E.G., SURFACE WATER), 3) CARCINOGENIC CONTAMINANTS AT THE SITE HAVE BEEN FOUND TO CAUSE CANCER IN ANIMALS ONLY, 4) CPFS WERE EXTRAPOLATED FROM HIGH DOSES GIVEN TO ANIMALS TO LOW DOSES RECEIVED FROM ENVIRONMENTAL EXPOSURES, 5) CARCINOGENIC POTENCY WAS EXTRAPOLATED FROM ANIMALS TO HUMANS ON THE BASIS OF DOSE PER SURFACE AREA, 6) NON-CANCER EFFECTS WERE EXTRAPOLATED FROM ANIMALS TO HUMANS BY A SET OF PROTECTIVE 10-FOLD UNCERTAINTY FACTORS, AND 7) DATA ON SYNERGISM OR ANTAGONISM AMONG THE CONTAMINANTS WERE NOT AVAILABLE. HOWEVER, THE MAJORITY OF THE RISK POSED BY THE SITE RESULTED FROM CONTAMINATED GROUND WATER WHICH HAS AN EXTENSIVE DATABASE OF HIGH QUALITY SAMPLES, I.E., SAMPLES WHICH PASSED A THOROUGH QUALITY ASSURANCE/QUALITY CONTROL REVIEW.

THE REMEDY SELECTED FOR OU1-DRINKING WATER ELIMINATES THE RISK FROM INGESTING GROUND WATER AND SHOWERING. THE REMEDY FOR OU2-GROUND WATER PREVENTS THE CURRENT CONTAMINATION FROM SPREADING AND WOULD REDUCE THE CONTAMINATION TO SAFE LEVELS. THE REMEDY FOR OU3-SOIL REMOVES SOIL CONTAMINATION, AND ACTS IN CONJUNCTION WITH THE GROUND WATER REMEDY TO REDUCE THE PRINCIPAL THREAT AT THE SITE. ESSENTIALLY, THE SOIL WILL BE ELIMINATED AS A SIGNIFICANT SOURCE OF GROUND WATER CONTAMINATION.

THERE IS NO SIGNIFICANT HUMAN HEALTH RISK DUE TO DIRECT CONTACT WITH THE SOIL. THE DEGREE OF GROUND WATER CONTAMINATION RESULTING FROM LEACHING OF THE CONTAMINANTS FROM THE SOIL INTO THE GROUND WATER IS EXPECTED TO BE WITHIN THE LIMITS CONSIDERED SAFE. HOWEVER, THE LEVEL OF SOIL CONTAMINATION IS EXPECTED TO DETECTABLY AFFECT THE GROUND WATER AND MAY INCREASE THE REMEDIAL TIME FOR OU2.

THE SUMMERS METHOD (PER EPA/540/2-89/057) ESTIMATES CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS (VOCs) IN SOIL THAT WOULD RESULT IN CONCENTRATIONS OF THE VOCs IN GROUND WATER ABOVE A SPECIFIED LEVEL (SUCH AS A LEVEL THAT IS PROTECTIVE OF HUMAN HEALTH - MCLS, OR A LEVEL THAT WOULD DETECTABLY AFFECT GROUND WATER - BACKGROUND). THIS METHOD PROVIDES A CONSERVATIVE RESULT, BUT HERE THE CALCULATION WAS ESPECIALLY CONSERVATIVE IN LIGHT OF THE ASSUMPTION THAT 90 PERCENT OF THE PRECIPITATION WOULD INFILTRATE. COMMONLY, INFILTRATION ACCOUNTS FOR LESS THAN 25 PERCENT OF PRECIPITATION. AT THE SITE, HOWEVER, THE CONTAMINATED SOIL LIES BENEATH A ROOF OVERHANG THAT MAY DIRECT RAINFALL ONTO THE SOIL. ALTHOUGH SOME RUNOFF UNDOUBTEDLY OCCURS, ASSUMING THAT 90 PERCENT OF THE RAINFALL INFILTRATES RESULTS IN A MAXIMUM LEACHING RATE FOR VOCs.

THE SUMMERS MODEL WAS EVALUATED FOR PCE, TCA, DCA, TCE, ETHYL BENZENE AND XYLENE BEHIND THE FABRICATION BUILDING. THE ALLOWABLE LEVEL IN THE SOIL WAS EXAMINED, FIRST UTILIZING THE MAXIMUM CONTAMINANT LEVEL (MCL) IN THE WATER, WHICH IS AN ENFORCEABLE EPA-SET STANDARD CONSIDERED TO BE

PROTECTIVE OF HUMAN HEALTH.

SOME OF THE ALLOWABLE CONCENTRATIONS MAY SEEM HIGH (E.G., XYLENE) DUE TO THE FACT THAT THE CONTAMINANT IS NOT PARTICULARLY TOXIC AND ADSORBS STRONGLY TO ORGANIC MATTER IN SOIL.

ALTHOUGH THE LEVELS OF CONTAMINATION IN THE SOIL ARE WITHIN THE PARAMETERS THAT EPA WOULD CONSIDER PROTECTIVE OF HUMAN HEALTH, FURTHER REMEDIATION IS NECESSARY TO PREVENT ADDITIONAL LEACHING OF CONTAMINATES FROM THE SOIL TO THE GROUND WATER. EPA ANTICIPATES THAT SOIL REMEDIATION WILL REMOVE THE THREAT OF CONTINUED LEACHING OF CONTAMINANTS TO THE GROUND WATER AND ELIMINATE THE NEED TO REMOVE THESE SUBSTANCES FROM THE GROUND WATER IN THE FUTURE. IT SHOULD ALSO SERVE TO REDUCE THE AMOUNT OF TIME NECESSARY FOR THE OPERATION OF THE GROUND WATER REMEDIATION SYSTEM.

NO FEDERALLY LISTED OR PROPOSED ENDANGERED OR THREATENED SPECIES ARE KNOWN TO OCCUR ON OR NEAR THE SITE. NO ENDANGERED OR THREATENED SPECIES LISTED BY THE COMMONWEALTH OF PENNSYLVANIA ARE KNOWN TO EXIST ON OR IN THE VICINITY OF THE SITE, BUT ONE STATE ENDANGERED SPECIES, THE BOG TURTLE, MAY EXIST ON OR NEAR THE SITE. NO STRUCTURES LISTED ON THE NATIONAL REGISTER OF HISTORIC PLACES EXIST WITHIN EARL TOWNSHIP, BERKS COUNTY, PENNSYLVANIA. THE IRONSTONE BRIDGE, WHICH CROSSES THE IRONSTONE CREEK AT FARMINGTON AVENUE IN DOUGLASS TOWNSHIP, BERKS COUNTY, PENNSYLVANIA, IS LISTED ON THE NATIONAL REGISTER OF HISTORIC PLACES, BUT IS NOT LOCATED NEAR THE SITE AND WOULD NOT BE IMPACTED BY THE ALTERNATIVES CONSIDERED FOR REMEDIATION OF THE SITE.

#DA

DESCRIPTION OF ALTERNATIVES

THIS SECTION OF THE ROD DESCRIBES THE PROCESS OF SCREENING AND DEVELOPING REMEDIAL ALTERNATIVES AND DISCUSSES IN DETAIL EACH OF THE SOIL REMEDIATION ALTERNATIVES EVALUATED IN THE PROPOSED PLAN. REMEDIAL ALTERNATIVES WERE DEVELOPED TO MEET THE REMEDIAL OBJECTIVES OF THIS RESPONSE ACTION. THE REMEDIAL OBJECTIVES ARE IDENTIFIED IN TABLE 12.

BASED UPON THE SCREENING AND EVALUATION OF POTENTIALLY APPLICABLE REMEDIAL TECHNOLOGIES AND MANAGEMENT OR PROCESS OPTIONS AND THE REQUIREMENT WITHIN THE NCP (SEE 40 CFR S 300.430(E)(6)) TO EVALUATE A "NO ACTION" ALTERNATIVE, THE FOLLOWING REMEDIAL ACTION ALTERNATIVES HAVE BEEN SELECTED FOR FURTHER DEVELOPMENT AND DETAILED EVALUATION:

1. NO ACTION.
2. SAMPLING OF CONTAMINATED AREA FOLLOWED BY SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU), REMOVAL OF SOIL AND DISPOSAL IN AN APPROVED RCRA LANDFILL, AND CONFIRMATORY SAMPLING.
3. SAMPLING OF CONTAMINATED AREA FOLLOWED BY SOIL VAPOR EXTRACTING (IN-SITU OR EX-SITU), AND CONFIRMATORY SAMPLING.
4. SAMPLING OF CONTAMINATED AREA FOLLOWED BY REMOVAL OF CONTAMINATED SOIL AND DISPOSAL IN AN OFF-SITE INCINERATOR, AND CONFIRMATORY SAMPLING.
5. SAMPLING OF CONTAMINATED AREA FOLLOWED BY CAPPING.

THE FOCUSED FEASIBILITY STUDY DEVELOPED ALTERNATIVES TO REMEDIATE THE SOIL. BASED UPON INFORMATION RECEIVED DURING THE PREPARATION OF THE PROPOSED PLAN, THE ALTERNATIVES PRESENTED BELOW ARE NOT IDENTICAL TO THE ALTERNATIVES IDENTIFIED IN THE FEASIBILITY STUDY, BUT EMPLOY MUCH OF THE SAME TECHNOLOGIES AND PROCESS OPTIONS. ALL COSTS AND IMPLEMENTATION TIMES PRESENTED

BELOW ARE ESTIMATES.

IT SHOULD ALSO BE NOTED THAT ALL ALTERNATIVES OTHER THAN "NO ACTION" REQUIRE FURTHER SAMPLING OF THE CONTAMINATED SOIL AREA TO BE COMPLETED PRIOR TO REMEDIATION OF THE SOIL TO BETTER DEFINE THE AREA OF CONTAMINATION. CONFIRMATORY SAMPLING WOULD BE CONDUCTED AT THE APPROPRIATE TIME AFTER THE REMEDIAL ACTION. AT THIS POINT, AN ESTIMATED 70 CUBIC YARD OF SOIL NEEDS TO BE REMEDIATED. THE COST OF THE SAMPLING HAS BEEN INCLUDED IN EACH ALTERNATIVE EXCEPT FOR THE NO ACTION ALTERNATIVE (FOR WHICH IT IS NOT APPLICABLE).

THE SAMPLING SHALL BE PERFORMED IN THE AREA BEHIND THE FABRICATION BUILDING AT THE FOLLOWING LOCATIONS (SEE FIGURE 10 LOCATIONS OF PRELIMINARY SAMPLES):

- 1) SOIL VAPOR SAMPLE SITE #13
- 2) BETWEEN SOIL VAPOR SAMPLE SITES #17 AND #22
- 3) SOIL VAPOR SAMPLE SITE #18

ONE SAMPLE SHALL ALSO BE TAKEN ON THE EAST SIDE OF THE FABRICATION BUILDING, FROM THE WET AREA DIRECTLY IN THE FRONT OF THE DOOR (NEAR RAILROAD TRACKS). THIS LOCATION IS SLIGHTLY WEST OF SOIL VAPOR PROBE LOCATION 32.

ANOTHER SAMPLE SHALL BE TAKEN FROM THE DRAIN OUTSIDE THE FABRICATION BUILDING, ALSO ON THE EAST SIDE OF THE BUILDING, IF THERE IS LIQUID STANDING IN THE DRAIN. A MINIMUM OF FOUR PRELIMINARY SAMPLES WILL BE TAKEN.

EACH SAMPLE SHALL BE TAKEN AT A DEPTH OF APPROXIMATELY 8 TO 12 INCHES, AND THE SAMPLES WILL BE ANALYZED INDIVIDUALLY FOR VOCs. THE LOCATION OF THE THREE CONFIRMATORY SAMPLES WILL BE DETERMINED IN THE FIELD.

IF SIGNIFICANT CONTAMINATION IS FOUND IN EITHER OF THE TWO ADDITIONAL SAMPLES TAKEN EAST OF THE FABRICATION BUILDING, THEN THE PUBLIC WILL BE PROVIDED WITH AN OPPORTUNITY TO COMMENT ON THE PROPOSED REMEDIATION OF THOSE AREA(S) SINCE THE POTENTIAL FOR CONTAMINATION OF THOSE AREAS WAS NOT ADDRESSED IN THE PROPOSED PLAN.

ALTERNATIVE 1: NO ACTION

CAPITAL COST:	\$0
ANNUAL O&M:	\$0
PRESENT WORTH:	\$0
IMPLEMENTATION:	\$0

THE NATIONAL CONTINGENCY PLAN (NCP) REQUIRES THAT EPA CONSIDER A "NO ACTION" ALTERNATIVE FOR EACH SITE. THIS ALTERNATIVE NEITHER PROVIDES FOR SOIL REMEDIATION NOR DOES IT REDUCE FURTHER SPREAD OF CONTAMINATION FROM THE CONTAMINATED SOIL. THIS ALTERNATIVE SERVES AS A BASELINE AGAINST WHICH THE OTHER ALTERNATIVES SHOULD BE COMPARED.

UNDER THE NO ACTION ALTERNATIVE, THE SITE WOULD REMAIN UNDER PRESENT CONDITIONS.

ALTERNATIVE 2: SAMPLING, SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU), REMOVAL AND DISPOSAL IN A RCRA SUBTITLE C LANDFILL, AND CONFIRMATORY SAMPLING

CAPITAL COST:	\$ 106,000 - \$ 119,000
ANNUAL O&M:	\$ 0
PRESENT WORTH:	\$ 106,000 - \$ 119,000
IMPLEMENTATION:	9 MONTHS

THIS ALTERNATIVE CALLS FOR SOIL SAMPLING FOLLOWED BY SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU), AND REMOVAL AND DISPOSAL IN A RCRA SUBTITLE C LANDFILL, AND SAMPLING TO MEASURE THE AMOUNT OF CONTAMINANT REDUCTION.

IN EX-SITU SOIL VAPOR EXTRACTION, THE SOIL IS EXCAVATED, AND TREATED WITHIN THE SAME AREA OF CONTAMINATION WITH A VACUUM EXTRACTION SYSTEM.

THE EXTRACTED VAPOR IS CAPTURED IN A CARBON FILTER UNIT AND THE CARBON IS PROPERLY DISPOSED OF OR REGENERATED ACCORDING TO FEDERAL AND STATE REGULATIONS. THE AIR STREAM IS SAMPLED AT PREDETERMINED TIME INTERVALS TO PROVIDE AN ONGOING EVALUATION OF THE PROCESS. SOIL REMEDIATION IS COMPLETE WHEN EQUILIBRIUM OCCURS. THE SOIL IS THEN SAMPLED TO MEASURE THE DECREASE IN THE CONTAMINANT LEVELS TO ASSURE THAT EACH CONTAMINANT IS PRESENT AT A CONCENTRATION OF LESS THAN 2 PPM.

IN-SITU SOIL VAPOR EXTRACTION EMPLOYS THE INSTALLATION OF VACUUM EXTRACTION PROBES TO REMOVE CONTAMINANTS FROM THE SOIL, AND CAPTURE OF THE EXTRACTED VAPOR IN A CARBON FILTER SYSTEM PRIOR TO RELEASE OF THE AIR TO THE ATMOSPHERE. THE CONTAMINANTS ENTRAINED IN THE CARBON FILTERS WILL BE PROPERLY DISPOSED OF OR REGENERATED ACCORDING TO FEDERAL AND STATE REGULATIONS. THE CONCENTRATION OF CONTAMINANTS IS MEASURED IN THE OFF-GAS FROM THE SYSTEM PRIOR TO CARBON TREATMENT. THE SYSTEM OPERATES UNTIL IT IS EFFECTIVELY NOT REMOVING ANY ADDITIONAL VOCs. THE SYSTEM IS THEN RUN INTERMITTENTLY UNTIL EQUILIBRIUM AGAIN OCCURS.

THE COMPLETION POINT FOR THE SOIL REMEDIATION COMPLETION WILL BE DETERMINED BY THE PERFORMANCE IN THE FIELD, BASED UPON ACHIEVING CONTINUOUS AND PULSE-PUMPING EQUILIBRIUM. THE AREA WOULD BE SAMPLED TO CONFIRM THAT THE CONCENTRATION OF EACH CONTAMINANT HAS BEEN REDUCED TO LESS THAN 2 PPM.

ANY WATER CAPTURED DURING IN-SITU SOIL VAPOR EXTRACTION WILL BE DISCHARGED TO THE GROUND WATER PUMP AND TREAT SYSTEM, CURRENTLY BEING DESIGNED.

UNDER EITHER METHOD OF SOIL VAPOR EXTRACTION THE VAPOR THAT IS RELEASED TO THE ATMOSPHERE WOULD MEET APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) OF FEDERAL AND STATE ENVIRONMENTAL LAWS, E.G. CLEAN AIR ACT AND 40 CFR S 264.1032.

SINCE THE FACILITY AT ONE TIME USED A SOLVENT THAT CONTAINED 93.5 PERCENT TCA, THE SOIL IS CONTAMINATED WITH A RCRA HAZARDOUS WASTE (WASTE CODES F001 - F005, 40 CFR S 261.31). THEREFORE, PRIOR TO REMOVAL THE SOIL MUST BE TREATED TO WITHIN THE CONCENTRATION RANGE OF 0.5 - 2 PPM. THIS ALTERNATIVE WILL MEET THE REQUIREMENTS OF THE LAND DISPOSAL RESTRICTIONS THROUGH A TREATABILITY VARIANCE UNDER 40 CFR S 268.44.

UNDER EPA'S "CONTAINED-IN" POLICY, "CONTAMINATED MEDIA (I.E., DEBRIS, SOIL, GROUNDWATER, SEDIMENTS) THAT CONTAIN RCRA WASTES MUST BE MANAGED AS IF THEY WERE HAZARDOUS WASTE UNTIL THE MEDIA NO LONGER CONTAIN THE HAZARDOUS WASTE (I.E., UNTIL DECONTAMINATED) OR UNTIL THEY ARE DELISTED. TO DATE, THE AGENCY HAS NOT ISSUED ANY DEFINITIVE GUIDANCE AS TO WHEN, OR AT WHAT LEVELS, ENVIRONMENTAL MEDIA CONTAMINATED WITH HAZARDOUS WASTE NO LONGER CONTAIN THE HAZARDOUS WASTE. UNTIL SUCH GUIDANCE IS ISSUED, (EPA) OR AUTHORIZED STATES MAY DETERMINE THESE LEVELS ON A CASE-SPECIFIC BASIS. (EPA) ALSO SUGGESTS THAT WHEN MAKING A DETERMINATION AS TO WHEN CONTAMINATED MEDIA NO LONGER CONTAINS A HAZARDOUS WASTE THAT A RISK ASSESSMENT APPROACH BE USED THAT ADDRESSES THE PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS OF THE HAZARDOUS CONSTITUENTS REMAINING." 56 FED. REG. 24456 (MAY 30, 1991). AFTER THE COMPLETION OF THE SOIL VAPOR EXTRACTION OR VENTING, THE CONTAMINATED SOIL WILL NO LONGER CONTAIN A RCRA HAZARDOUS WASTE. BASED UPON THE RESULTS OF THE CONFIRMATION SAMPLING AND LANDFILL AVAILABILITY, EPA MAY SEEK TO DISCARD THE SOIL AS NON-HAZARDOUS.

THOUGH AFTER TREATMENT THE SOILS WILL NO LONGER CONTAIN HAZARDOUS SUBSTANCES, FOR COSTING PURPOSES, IT WILL BE ASSUMED THAT ALL EXCAVATED SOILS WILL BE TREATED AS HAZARDOUS WASTE.

THE TREATED SOIL WILL BE LOADED INTO 55-GALLON DRUMS, AND TRANSPORTED TO A RCRA SUBTITLE C LANDFILL FOR DISPOSAL. THE EXCAVATED AREA WOULD BE BACKFILLED WITH COMPACTED COMMON EARTH, COVERED WITH TOPSOIL, AND SEEDED WITH GRASS. SINCE THE CONTAMINATION IS REMOVED, THERE ARE NO OPERATION AND MAINTENANCE COSTS.

THE ESTIMATED CAPITAL COST FOR ALTERNATIVE 2 IS DEPICTED IN TABLES 13A AND 13B.

ALTERNATIVE 3: SAMPLING, SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU), AND CONFIRMATORY SAMPLING

CAPITAL COST:	\$ 53,500 - \$ 66,400
ANNUAL O&M:	\$ 0
PRESENT WORTH:	\$ 53,500 - \$ 66,400
IMPLEMENTATION:	9 MONTHS

THIS ALTERNATIVE EMPLOYS SOIL SAMPLING FOLLOWED BY SOIL VAPOR VENTING OR EXTRACTION. THE AREA WOULD BE SAMPLED TO MEASURE THE AMOUNT OF CONTAMINANT REDUCTION.

AS DESCRIBED ABOVE, IN EX-SITU SOIL VAPOR EXTRACTION, THE SOIL IS EXCAVATED, AND TREATED WITHIN THE SAME AREA OF CONTAMINATION WITH A VACUUM EXTRACTION SYSTEM. THE EXTRACTED VAPOR IS CAPTURED IN A CARBON FILTER UNIT, AND THE CARBON IS PROPERLY DISPOSED OF OR REGENERATED ACCORDING TO FEDERAL AND STATE REGULATIONS. THE AIR STREAM IS SAMPLED AT PREDETERMINED TIME INTERVALS TO PROVIDE AN ONGOING EVALUATION OF THE PROCESS. SOIL REMEDIATION IS COMPLETE WHEN EQUILIBRIUM OCCURS. THE SOIL IS THEN SAMPLED TO MEASURE THE DECREASE IN THE CONTAMINANT LEVELS TO ASSURE THAT EACH CONTAMINANT IS PRESENT AT A CONCENTRATION OF LESS THAN 2 PPM.

IN-SITU SOIL VAPOR EXTRACTION EMPLOYS THE INSTALLATION OF VACUUM EXTRACTION PROBES TO REMOVE CONTAMINANTS FROM THE SOIL, AND CAPTURE OF THE EXTRACTED VAPOR IN A CARBON FILTER SYSTEM PRIOR TO RELEASE OF THE AIR TO THE ATMOSPHERE. THE CONTAMINANTS ENTRAINED IN THE CARBON FILTERS WILL BE PROPERLY DISPOSED OF OR REGENERATED ACCORDING TO FEDERAL AND STATE REGULATIONS. THE CONCENTRATION OF CONTAMINANTS IS MEASURED IN THE OFF-GAS FROM THE SYSTEM PRIOR TO CARBON TREATMENT. THE SYSTEM OPERATES UNTIL IT IS EFFECTIVELY NOT REMOVING ANY ADDITIONAL VOCs. THE SYSTEM IS THEN RUN INTERMITTENTLY UNTIL EQUILIBRIUM AGAIN OCCURS. THE COMPLETION POINT FOR THE SOIL REMEDIATION WILL BE DETERMINED BY THE PERFORMANCE IN THE FIELD, BASED UPON ACHIEVING CONTINUOUS AND PULSE-PUMPING EQUILIBRIUM. THE AREA WOULD BE SAMPLED TO CONFIRM THAT THE CONCENTRATION OF EACH CONTAMINANT HAS BEEN REDUCED TO LESS THAN 2 PPM.

ANY WATER CAPTURED DURING IN-SITU SOIL VAPOR EXTRACTION WILL BE DISCHARGED TO THE GROUND WATER PUMP AND TREAT SYSTEM, CURRENTLY BEING DESIGNED.

UNDER EITHER METHOD OF SOIL VAPOR EXTRACTION THE VAPOR THAT IS RELEASED TO THE ATMOSPHERE WOULD MEET APPLICABLE ARARS, E.G. CLEAN AIR ACT AND 40 CFR S 264.1032.

SINCE THE FACILITY AT ONE TIME USED A SOLVENT THAT CONTAINED 93.5 PERCENT TCA, THE SOIL IS CONTAMINATED WITH A RCRA HAZARDOUS WASTE (WASTE CODES F001 - F005, 40 CFR S 261.31). THE LAND DISPOSAL RESTRICTIONS ARE NOT ARARS FOR THIS ALTERNATIVE, HOWEVER, SINCE THE WASTE WOULD BE TREATED IN THE SAME AREA OF CONTAMINATION.

AFTER THE COMPLETION OF THE SOIL VAPOR EXTRACTION THE CONTAMINATED SOIL WILL NO LONGER CONTAIN A HAZARDOUS SUBSTANCE, EVEN BASED UPON THE CURRENT RISK ASSESSMENT.

THE ESTIMATED CAPITAL COST FOR ALTERNATIVE 3 IS DEPICTED IN TABLES 14A AND 14B.

ALTERNATIVE 4: SAMPLING, REMOVAL AND DISPOSAL VIA AN OFF-SITE INCINERATOR, CONFIRMATORY SAMPLING

CAPITAL COST:	\$ 190,000
ANNUAL O&M:	\$ 0
PRESENT WORTH:	\$ 190,000
IMPLEMENTATION:	2 MONTHS

IN THIS ALTERNATIVE THE CONTAMINATED SOIL WOULD BE TRANSPORTED TO A RCRA-PERMITTED SUBTITLE C INCINERATOR FOR TREATMENT AND DISPOSAL. AFTER EXCAVATION, THE AREA WOULD BE SAMPLED TO MEASURE THE AMOUNT OF CONTAMINANT REDUCTION. SINCE THE CONTAMINATION IS REMOVED, THERE WOULD BE NO OPERATION AND MAINTENANCE COSTS.

THIS ALTERNATIVE WILL MEET THE REQUIREMENTS OF THE LAND DISPOSAL RESTRICTIONS THROUGH A TREATABILITY VARIANCE UNDER 40 CFR S 268.44. THIS VARIANCE WILL RESULT IN THE USE OF INCINERATION TO ATTAIN THE AGENCY'S TREATMENT RANGES FOR THE CONTAMINATED SOIL AT THE SITE.

THE ESTIMATED CAPITAL COST FOR ALTERNATIVE 4 IS DEPICTED IN TABLE 15.

ALTERNATIVE 5: SAMPLING AND CAPPING

CAPITAL COST:	\$ 27,230
ANNUAL O&M:	\$ 500
30 YEARS O&M:	\$ 7,700
PRESENT WORTH:	\$ 34,900
IMPLEMENTATION:	2 MONTHS

THIS ALTERNATIVE EMPLOYS PRELIMINARY SAMPLING FOLLOWED BY CAPPING. SINCE A CAP WOULD BE INSTALLED, THERE ARE LONG-TERM OPERATION AND MAINTENANCE COSTS.

THE CAP, WHICH IS MULTI-LAYERED, WOULD EFFECTIVELY PREVENT ANY FURTHER LEACHING OF CONTAMINATION FROM THE SOIL INTO THE GROUND WATER BY REDUCING THE PERMEABILITY. THE SUMMERS MODEL CALCULATIONS FOR THIS SCENARIO SHOW THAT CAPPING VIRTUALLY ELIMINATES INFILTRATION OF RAINWATER, SO THAT THERE IS NO LONGER ANY DETECTABLE EFFECT ON GROUND WATER. THE CAP WOULD CONSIST OF, FROM THE BOTTOM UP, A LAYER SUCH AS GUNDSEAL OR CLAYMAX (WHICH ACTS AS A LOW PERMEABILITY CLAY LAYER), A GEOMEMBRANE, A SAND LAYER (FOR DRAINAGE), AND A CONCRETE LAYER (4000 PSI). ALSO, THE CAP WILL BE DESIGNED TO BE AS THIN AS POSSIBLE SO AS TO NOT INTERFERE WITH THE DOORWAYS ALONG THE REAR OF THE FABRICATION BUILDING.

SINCE THE FACILITY AT ONE TIME USED A SOLVENT THAT CONTAINED 93.5 PERCENT TCA, THE SOIL IS CONTAMINATED WITH A RCRA HAZARDOUS WASTE (WASTE CODES F001 - F005, 40 CFR S 261.31). THE LAND DISPOSAL RESTRICTIONS ARE NOT ARARS FOR THIS ALTERNATIVE. RCRA CLOSURE AND POST-CLOSURE REGULATIONS, 40 CFR PART 264, SUBPART G ARE APPLICABLE BECAUSE THE SOIL CONTAINING A RCRA WASTE IS LEFT IN PLACE. SINCE THE WASTE WOULD BE LEFT IN PLACE A REVIEW WILL BE CONDUCTED WITHIN FIVE YEARS, AND EVERY FIVE YEARS THEREAFTER, AS REQUIRED BY SECTION 121(C) OF CERCLA, 42 USC S 9621(C).

THE ESTIMATED CAPITAL COST FOR ALTERNATIVE 5 IS DEPICTED IN TABLE 16.

#SCAA

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

EACH OF THE REMEDIAL ALTERNATIVES FOR OU3 WAS COMPARED AND EVALUATED AGAINST NINE CRITERIA TO

DETERMINE WHICH REMEDIAL ALTERNATIVE AND COMBINATION OF TECHNOLOGIES AND PROCESS OPTIONS WOULD BEST MEET THE REMEDIAL OBJECTIVES OF THIS RESPONSE ACTION. THE EVALUATION OF REMEDIAL ALTERNATIVES AGAINST THE NINE CRITERIA IS REQUIRED BY THE NCP, SEE 40 CFR S 300.430(E)(9)(III). THE COMPARATIVE EVALUATION OF ALTERNATIVES ALLOWS EPA TO SELECT THE OPTION WHICH MOST APPROPRIATELY MEETS THE REMEDIAL OBJECTIVE FOR OU3. THE FOLLOWING SECTION DEFINES EACH OF THE NINE EVALUATION CRITERIA AND COMPARES EACH OF THE REMEDIAL ALTERNATIVES DEVELOPED IN THIS ROD AGAINST EACH OF THE NINE EVALUATION CRITERIA.

THRESHOLD CRITERIA

A. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT: WHETHER A REMEDY PROVIDES ADEQUATE PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT AND DESCRIBES HOW RISKS POSED THROUGH EACH EXPOSURE PATHWAY ARE ELIMINATED, REDUCED OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS.

ALL OF THE ALTERNATIVES, WITH THE EXCEPTION OF THE "NO ACTION" ALTERNATIVE, WOULD PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. SINCE THE "NO ACTION" ALTERNATIVE DOES NOT PREVENT THE FURTHER LEACHING OF CONTAMINATION FROM THE SOIL TO THE GROUND WATER, IT IS NOT CONSIDERED FURTHER IN THIS ANALYSIS AS AN OPTION.

B. COMPLIANCE WITH ARARS: WHETHER A REMEDY WILL MEET ALL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) OF FEDERAL AND STATE ENVIRONMENTAL LAWS. UNDER SECTION 121(D) OF CERCLA, 42 USC S 9621(D), AND EPA GUIDANCE, REMEDIAL ACTIONS AT CERCLA SITES MUST ATTAIN LEGALLY APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE ENVIRONMENTAL STANDARDS, REQUIREMENTS, CRITERIA, AND LIMITATIONS. APPLICABLE REQUIREMENTS ARE THOSE SUBSTANTIVE ENVIRONMENTAL PROTECTION REQUIREMENTS, CRITERIA, OR LIMITATIONS, PROMULGATED UNDER FEDERAL OR

STATE LAW THAT SPECIFICALLY ADDRESS HAZARDOUS SUBSTANCES FOUND AT A SITE, THE REMEDIAL ACTION TO BE IMPLEMENTED, THE LOCATION OF A SITE, OR OTHER SPECIAL CIRCUMSTANCES. RELEVANT AND APPROPRIATE REQUIREMENTS ARE THOSE SUBSTANTIVE ENVIRONMENTAL PROTECTION REQUIREMENTS, CRITERIA, OR LIMITATIONS PROMULGATED UNDER FEDERAL OR STATE LAW WHICH, WHILE NOT APPLICABLE TO THE HAZARDOUS SUBSTANCES AT A SITE, THE REMEDIAL ACTION, SITE LOCATION, OR OTHER CIRCUMSTANCES, NEVERTHELESS ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT A SITE THAT THEIR USE IS WELL SUITED TO THAT SITE.

ALTERNATIVES 2, 4, AND 5 WOULD MEET THEIR RESPECTIVE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS OF FEDERAL ENVIRONMENTAL LAWS.

THE SELECTED REMEDY UTILIZES SECTION 121(D)(4)(D) OF CERCLA TO WAIVE A STATE REQUIREMENT FOR CAPPING OF THE AREA, BECAUSE IT WILL ACHIEVE AN EQUIVALENT STANDARD OF PERFORMANCE.

TABLE 17 IDENTIFIES ARARS FOR THE ALTERNATIVES DEVELOPED IN THIS ROD AND TABLE 18 LISTS EACH ALTERNATIVE COMPLIANCE STATUS WITH ARARS.

PRIMARY BALANCING CRITERIA

C. LONG-TERM EFFECTIVENESS AND PERMANENCE: THE ABILITY OF A REMEDY TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME, ONCE CLEAN-UP GOALS HAVE BEEN MET.

ALL OF THE ALTERNATIVES ARE EFFECTIVE IN THE LONG-TERM AND PERMANENT, ALTHOUGH ALTERNATIVE 5 IS LESS EFFECTIVE IN THE LONG TERM THAN THE OTHER ALTERNATIVES. ALTERNATIVE 5 PROVIDES FOR CAPPING. THE CAP WOULD BE DESIGNED AND CONSTRUCTED TO PROMOTE DRAINAGE, MINIMIZE EROSION OF THE COVER, AND PROVIDE LONG-TERM MINIMAL MIGRATION OF LIQUIDS THROUGH THE UNDERLYING CONTAMINATED SOIL. LONG-TERM OPERATION AND MAINTENANCE IS REQUIRED TO ENSURE THE INTEGRITY OF THE CAP. UNDER ALTERNATIVES 2 AND 4, THE CONTAMINATED SOIL IS REMOVED AND SENT TO A RCRA LANDFILL OR

INCINERATED. ALTERNATIVE 3 PROVIDES FOR THE REMOVAL OF MOST OF THE CONTAMINATION FROM THE SOIL.

D. REDUCTION OF TOXICITY, MOBILITY OR VOLUME OF THE CONTAMINANTS THROUGH TREATMENT: THE ANTICIPATED PERFORMANCE OF THE TREATMENT TECHNOLOGIES A REMEDY MAY EMPLOY.

ALTERNATIVES 2, 3 AND 4 TREAT THE CONTAMINATED SOIL TO REDUCE THE TOXICITY, MOBILITY, OR VOLUME OF THE ORGANICS. ALTERNATIVE 4 PROVIDES FOR INCINERATION THUS DESTROYING THE CONTAMINATION, AND ALTERNATIVES 2 AND 3 REDUCE THE CONTAMINATION THROUGH SOIL VAPOR EXTRACTION. ALTERNATIVE 5 DOES NOT TREAT THE CONTAMINATION, WOULD NOT REDUCE TOXICITY OR VOLUME BUT WOULD MINIMIZE MOBILITY AND WOULD REQUIRE LONG TERM OPERATION AND MAINTENANCE.

E. SHORT-TERM EFFECTIVENESS: THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION AND ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD, UNTIL CLEAN-UP GOALS ARE ACHIEVED.

ALTERNATIVES 4 AND 5 CAN BE COMPLETED IN THE LEAST AMOUNT OF TIME COMPARED WITH THE OTHER ALTERNATIVES. ALTERNATIVES 2 AND 4, WHICH INCLUDE EXCAVATION, AND ALTERNATIVE 3, WHICH INCLUDES SOME EXCAVATION, WOULD POSE SOME SHORT-TERM RISK OF EXPOSURE TO VOCs DURING THE EXCAVATION PROCESS. UNDER ALTERNATIVES 2 AND 3, ONCE THE VOCs HAVE BEEN COLLECTED IN CANISTERS, THERE IS SOME MINOR, SHORT-TERM RISK OF EXPOSURE TO THE COMMUNITY DURING TRANSPORTATION OF THE CANISTERS TO A TREATMENT FACILITY.

F. IMPLEMENTABILITY: THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING THE AVAILABILITY OF MATERIALS AND SERVICES NEEDED TO IMPLEMENT A PARTICULAR OPTION.

ALL ALTERNATIVES ARE CONSIDERED TECHNICALLY IMPLEMENTABLE. THEY UTILIZE PROVEN ENGINEERING PROCESSES IMPLEMENTED AT SIMILAR SUPERFUND SITES. THE AVAILABILITY OF RCRA SUBTITLE C DISPOSAL CAPACITY COULD BE A LIMITING FACTOR. THERE ARE NO ASSOCIATED ADMINISTRATIVE DIFFICULTIES THAT WOULD IMPEDE IMPLEMENTATION OF ANY OF THE ALTERNATIVES.

G. COST: ESTIMATED CAPITAL, OPERATION AND MAINTENANCE (O&M), AND NET PRESENT WORTH COSTS.

THE ESTIMATED COST OF EACH ALTERNATIVE IS PRESENTED IN TABLE 19 SUMMARY OF ESTIMATED COSTS. THE COST OF THE ALTERNATIVE 3 IS \$ 53,500 - \$ 66,420. THE COST OF ALTERNATIVE 2 IS \$ 119,000, THE COST OF ALTERNATIVE 4 IS \$ 190,000, AND THE COST OF ALTERNATIVE 5 IS \$ 34,920.

MODIFYING CRITERIA

H. STATE ACCEPTANCE: WHETHER THE STATE CONCURS WITH, OPPOSES, OR HAS NO COMMENT REGARDING THE SELECTED REMEDY.

THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES HAS CONCURRED WITH THE SELECTED REMEDY.

I. COMMUNITY ACCEPTANCE: THE PUBLIC'S GENERAL RESPONSE TO THE ALTERNATIVES.

THE PUBLIC GENERALLY AGREED WITH EPA'S SELECTION OF SAMPLING FOLLOWED BY SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU) AND CONFIRMATORY SAMPLING. A PUBLIC MEETING WAS HELD ON AUGUST 15, 1991. THERE WAS NO DISAGREEMENT WITH THE SELECTED REMEDY VOICED AT THE MEETING. EPA'S RESPONSE TO PUBLIC COMMENTS IS CONTAINED WITH APPENDIX A.

#SR

THE SELECTED REMEDY

EPA HAS SELECTED ALTERNATIVE 3, SAMPLING, SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU), AND CONFIRMATORY SAMPLING AS THE REMEDY FOR OU3. THE SPECIFICS OF THE REMEDIAL SYSTEM (IN-SITU OR EX-SITU) WILL BE DETERMINED DURING THE REMEDIAL DESIGN STUDY, BASED UPON BEST ENGINEERING JUDGEMENT.

THIS ALTERNATIVE CALLS FOR PRELIMINARY SOIL SAMPLING FOLLOWED BY SOIL VAPOR VENTING OR EXTRACTION, AT AN ESTIMATED COST OF \$53,500 (SOIL VENTING) TO \$66,400 (SOIL VAPOR EXTRACTION). SEE TABLES 14A AND 14B FOR COSTING BREAKDOWNS.

THE PRELIMINARY SAMPLING SHALL BE PERFORMED IN THE AREA BEHIND THE FABRICATION BUILDING AT THE FOLLOWING LOCATIONS (SEE FIGURE 10 LOCATIONS OF PRELIMINARY SAMPLES):

- 1) SOIL VAPOR SAMPLE SITE #13
- 2) BETWEEN SOIL VAPOR SAMPLE SITES #17 AND #22
- 3) SOIL VAPOR SAMPLE SITE #18

THE RESULTS OF THE THREE SAMPLES SHALL AID IN THE DESIGN OF THE SOIL VAPOR EXTRACTION SYSTEM.

ONE SAMPLE SHALL ALSO BE TAKEN ON THE EAST SIDE OF THE FABRICATION BUILDING, FROM THE WET AREA DIRECTLY IN THE FRONT OF THE DOOR (NEAR RAILROAD TRACKS). THIS LOCATION IS SLIGHTLY WEST OF SOIL VAPOR PROBE LOCATION 32.

ANOTHER SAMPLE SHALL BE TAKEN FROM THE DRAIN OUTSIDE THE FABRICATION BUILDING, ALSO ON THE EAST SIDE OF THE BUILDING, IF THERE IS LIQUID STANDING IN THE DRAIN. A MINIMUM OF FOUR PRELIMINARY SAMPLES WILL BE TAKEN.

EACH SAMPLE SHALL BE TAKEN AT A DEPTH OF APPROXIMATELY 8 TO 12 INCHES, AND THE SAMPLES WILL BE ANALYZED INDIVIDUALLY FOR VOCs. THE LOCATION OF THE THREE CONFIRMATORY SAMPLES WILL BE DETERMINED IN THE FIELD.

IN EX-SITU SOIL VAPOR EXTRACTION, THE SOIL IS EXCAVATED, AND TREATED WITHIN THE SAME AREA OF CONTAMINATION WITH A VACUUM EXTRACTION SYSTEM. DUST SUPPRESSANTS SUCH AS A WATER SPRAY WILL BE USED TO CURTAIL PARTICULATE EMISSIONS IF NECESSARY. THE EXTRACTED VAPOR IS CAPTURED IN A CARBON FILTER UNIT, AND THE CARBON IS PROPERLY DISPOSED OF OR REGENERATED ACCORDING TO FEDERAL AND STATE REGULATIONS. THE AIR STREAM IS SAMPLED AT PREDETERMINED TIME INTERVALS TO PROVIDE AN ONGOING EVALUATION OF THE PROCESS. SOIL REMEDIATION IS COMPLETE WHEN EQUILIBRIUM OCCURS. THE SOIL WILL BE SAMPLED TO MEASURE THE DECREASE IN THE CONTAMINANT LEVELS.

IN-SITU SOIL VAPOR EXTRACTION EMPLOYS THE INSTALLATION OF VACUUM EXTRACTION PROBES TO REMOVE CONTAMINANTS FROM THE SOIL, AND CAPTURE OF THE EXTRACTED VAPOR IN A CARBON FILTER SYSTEM PRIOR TO RELEASE OF THE AIR TO THE ATMOSPHERE. THE CONTAMINANTS ENTRAINED IN THE CARBON FILTERS WILL BE PROPERLY DISPOSED OF OR REGENERATED ACCORDING TO FEDERAL AND STATE REGULATIONS. THE CONCENTRATION OF CONTAMINANTS IS MEASURED IN THE OFF-GAS FROM THE SYSTEM PRIOR TO CARBON TREATMENT. THE SYSTEM OPERATES UNTIL IT IS EFFECTIVELY NOT REMOVING ANY ADDITIONAL VOCs. THE SYSTEM IS THEN RUN INTERMITTENTLY UNTIL EQUILIBRIUM AGAIN OCCURS. THE COMPLETION POINT FOR THE SOIL REMEDIATION WILL BE DETERMINED BY THE PERFORMANCE IN THE FIELD, BASED UPON ACHIEVING CONTINUOUS AND PULSE-PUMPING EQUILIBRIUM. THE AREA WILL BE SAMPLED TO MEASURE THE REDUCTION IN THE CONCENTRATION OF EACH CONTAMINANT.

THE SHALLOW WATER TABLE MAY DECREASE THE EFFECTIVENESS OF IN-SITU SOIL VAPOR EXTRACTION. IN ADDITION, THE SURFACE NEAR THE TRENCH MAY HAVE TO BE APPROPRIATELY SEALED TO DECREASE THE AMOUNT OF ATMOSPHERIC AIR ENTERING THE SYSTEM AND TO INCREASE THE AREA OF SOIL VAPOR FLOW. PRECAUTIONS WILL BE TAKEN TO ENSURE THE INTEGRITY OF THE FABRICATION BUILDING.

ANY WATER CAPTURED DURING IN-SITU SOIL VAPOR EXTRACTION WILL BE DISCHARGED TO THE GROUND WATER PUMP AND TREAT SYSTEM, CURRENTLY BEING DESIGNED.

SOME CHANGES MAY BE MADE TO THE REMEDY AS A RESULT OF THE REMEDIAL DESIGN AND CONSTRUCTION PROCESS. SUCH CHANGES, IN GENERAL, REFLECT MODIFICATIONS RESULTING FROM THE ENGINEERING DESIGN PROCESS. EPA DOES NOT INTEND TO CONTINUE REMEDIATION FOR OU3 BEYOND THE SOIL VAPOR EXTRACTION SINCE IT IS KNOWN THAT LEVELS IN THE SOIL WILL BE BELOW LEVELS THAT ARE PROTECTIVE OF HUMAN HEALTH.

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STATUTORY DETERMINATIONS

THE SELECTED REMEDY SATISFIES THE REMEDY SELECTION REQUIREMENTS OF SECTION 121 OF CERCLA (42 USC SECTION 9621) AND THE NCP (40 CFR SECTION 300.430(E)). THE REMEDY PROVIDES PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT, ACHIEVES COMPLIANCE WITH ARARS, UTILIZES PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE, CONTAINS TREATMENT AS A PRINCIPAL ELEMENT, AND IS COST EFFECTIVE.

A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT: THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. BY REDUCING THE AMOUNT OF CONTAMINATION IN THE SOIL, THE POTENTIAL FOR CONTAMINATION LEACHING FROM THE SOIL INTO THE GROUND WATER IS REDUCED. EPA EXPECTS THAT THE COMBINATION OF THE SOIL REMEDIATION AND THE REMEDIAL ACTION FOR OU2 WILL FORM A SYSTEM THAT STRIVES TO MEET BACKGROUND CONDITIONS IN THE GROUNDWATER.

EPA EXPECTS TO MEET AIR QUALITY STANDARDS IN THE OFF-GAS FROM THE SYSTEM.

IMPLEMENTATION OF THE SELECTED REMEDY WILL NOT POSE UNACCEPTABLE SHORT-TERM RISKS OR CROSS-MEDIA IMPACTS.

B. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS): THE SELECTED REMEDY WILL COMPLY WITH ALL FEDERAL ARARS. AN ARAR WAIVER WILL BE USED FOR 25 PA. CODE CH. 75 (HEREINAFTER CITED AS "25 PA. CODE") SS 265.1, 265.300, AND 265.310 UNDER SECTION 121(D)(4)(D) OF CERCLA, 42 USC S 9621(D)(4)(D), SINCE AN EQUIVALENT STANDARD OF PERFORMANCE WILL BE ATTAINED.

PADER SEEKS A DEGREE OF REMEDIATION SUCH THAT THE SOIL REMEDY, COMBINED WITH THE SELECTED REMEDY FOR OU2, WILL REMEDIATE THE GROUND WATER TO BACKGROUND LEVELS OF CONTAMINATION. THE PENNSYLVANIA ARAR FOR GROUND WATER FOR HAZARDOUS SUBSTANCES IS THAT GROUND WATER MUST BE REMEDIATED TO "BACKGROUND" QUALITY AS SPECIFIED BY 25 PA. CODE SS 264.90-264.100 AND IN PARTICULAR 25 PA. CODE SS 264.97(I),(J) AND 264.100(A)(9). THE COMMONWEALTH OF PENNSYLVANIA ALSO MAINTAINS THAT THE REQUIREMENT TO REMEDIATE TO BACKGROUND IS ALSO FOUND IN OTHER LEGAL AUTHORITIES.

WITH RESPECT TO THE SPILL AREA, PADER IDENTIFIED POTENTIAL ARARS IN A LETTER DATED AUGUST 7, 1991, STATING THAT "PA. CODE SS 204.1(SIC), 264.300 AND 264.310 REQUIRE CAPPING OF THE DISPOSAL AREA. EVEN IF THE DISPOSAL ACTIVITIES AT THE SITE CEASED BEFORE SEPTEMBER 26, 1982, THE SITE WOULD FALL WITHIN THE GUIDELINES OF 25 PA. CODE SS 265.1, 265.300, AND 265.310." UNDER EITHER SET OF REGULATIONS, PADER WOULD REQUIRE A FINAL COVER (CLOSURE AND POST-CLOSURE CARE OF A LANDFILL).

25 PA. CODE PART 264 SETS FORTH THE MINIMUM STANDARDS FOR NEW HAZARDOUS WASTE MANAGEMENT FACILITIES AND THE CLOSURE AND POST-CLOSURE CARE OF A HAZARDOUS WASTE SURFACE IMPOUNDMENT, WASTE PILE, LAND TREATMENT OR LANDFILL FACILITY THAT ACCEPTED HAZARDOUS WASTE ON OR AFTER JULY 26, 1982 WHICH DOES NOT HAVE A HAZARDOUS WASTE PERMIT.

25 PA. CODE PART 265 ESTABLISHES MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS, AND APPLIES TO OWNERS OR OPERATORS OF FACILITIES IN EXISTENCE ON NOVEMBER 19, 1980, WHO HAVE FAILED TO PROVIDE TIMELY NOTIFICATION.

SINCE CRYOCHEM, INC. IS NOT A NEW FACILITY AND IT APPEARS THAT THE SPILL OCCURRED BEFORE JULY 26, 1982, EPA HAS DETERMINED THAT 25 PA. CODE SS 265.1, 265.300, AND 265.310 ARE THE RELEVANT REGULATIONS TO EXAMINE. 25. PA. CODE S 265.300 SPECIFICALLY APPLIES TO OWNERS AND OPERATORS OF FACILITIES THAT DISPOSE OF HAZARDOUS WASTE IN LANDFILLS (INCLUDING WASTE PILES USED BY DISPOSAL FACILITIES). 25 PA. CODE S 265.310 ADDRESSES CLOSURE AND POST-CLOSURE CARE AT SUCH FACILITIES.

EPA BELIEVES THAT THE AREA BEHIND THE FABRICATION BUILDING IS A SPILL AREA. THE PENNSYLVANIA REGULATIONS DEFINE A SPILL AS A "DISCHARGE" WHICH IS AN "INTENTIONAL OR ACCIDENTAL SPILLING, LEAKING, PUMPING, POURING, DUMPING, EMITTING OR OTHER RELEASE OF HAZARDOUS WASTES, HAZARDOUS WASTE CONSTITUENTS OR HAZARDOUS MATERIALS WHICH, WHEN RELEASED INTO OR ONTO LAND OR WATER, BECOMES HAZARDOUS WASTE." A LANDFILL IS DEFINED AS A "DISPOSAL FACILITY OR PART OF A FACILITY WHERE HAZARDOUS WASTE IS PLACED IN OR ON LAND..." A DISPOSAL FACILITY IS DEFINED AS A "FACILITY OR PART OF A FACILITY AT WHICH HAZARDOUS WASTE IS PLACED INTO OR ON LAND OR WATER AND AT WHICH WASTE WILL REMAIN AFTER CLOSURE." SEE, 25 PA. CODE PART 260.

PADER ASSERTS THAT ONCE THE SPILL OCCURRED AND WAS LEFT IN PLACE, THE AREA BEHIND THE FABRICATION BUILDING BECAME A HAZARDOUS WASTE DISPOSAL FACILITY, PER THEIR DEFINITIONS. EPA RECOGNIZES THIS INTERPRETATION AND FINDS THAT 25 PA. CODE SS 265.1, 265.300, AND 265.310 ARE RELEVANT AND ARE APPROPRIATE.

EPA BELIEVES THAT THE SOIL VAPOR EXTRACTION REMEDY FOR OU3 COMBINED WITH THE GROUND WATER PUMP AND TREAT SYSTEM FOR OU2 FORMS A SYSTEM DESIGNED TO MEET THE BACKGROUND REQUIREMENTS FOR THE GROUND WATER. THESE SYSTEMS, ACTING TOGETHER, WILL ATTAIN A STANDARD OF PERFORMANCE THAT IS EQUIVALENT TO THE LANDFILL CLOSURE AND POST-CLOSURE CARE REQUIRED BY 25 PA. CODE SS 265.1, 265.300, AND 265.310. THEREFORE, EPA IS WAIVING THE REQUIREMENTS OF 25 PA. CODE SS 265.1, 265.300, AND 265.310 UNDER SECTION 121(D)(4)(D) OF CERCLA.

EPA BELIEVES THAT 25 PA. CODE S 262.46(C) IS AN ARAR RELATED TO SPILLS, WHICH SPECIFICALLY ADDRESSES CLEANUPS OF SPILLS DUE TO PLANT OPERATION. UNDER THAT REGULATION A GENERATOR SHALL ". . . TAKE ACTIONS THAT MAY BE REQUIRED OR APPROVED BY THE DEPARTMENT SO THAT THE DISCHARGE OR SPILL NO LONGER PRESENTS A HAZARD TO THE HEALTH AND SAFETY OF THE PUBLIC OR THE ENVIRONMENT".

IN ADDITION, THE FOLLOWING ACTION-SPECIFIC ARARS WILL BE ATTAINED BY THE SELECTED REMEDY (CHEMICAL-SPECIFIC AND LOCATION-SPECIFIC ARARS HAVE NOT BEEN IDENTIFIED FOR OU3):

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

- * 40 CFR S 261.4(D), WHICH DESCRIBES THE CONDITIONS UNDER WHICH A SAMPLE WOULD NOT BE CONSIDERED A HAZARDOUS WASTE.
- * 40 CFR PART 262, WHICH ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE. THE CARBON UNITS WILL BE CONSIDERED A HAZARDOUS WASTE.
- * 40 CFR PART 264, SUBPART AA, WHICH SETS THE REQUIREMENTS FOR AIR EMISSION STANDARDS FOR PROCESS VENTS.
- * 40 CFR PART 264, SUBPART BB, WHICH SETS THE REQUIREMENTS FOR AIR EMISSION STANDARDS FOR PROCESS LEAKS.

CLEAN AIR ACT

- * 40 CFR PART 60, WHICH ESTABLISHES THE GENERAL PROVISIONS AND PERFORMANCE STANDARDS FOR STATIONARY SOURCES OF AIR EMISSIONS.
- * 40 CFR PART 50, WHICH INCLUDES STANDARDS THAT DEFINE LEVELS OF AIR QUALITY WHICH ARE NECESSARY TO PROTECT PUBLIC HEALTH. THE STANDARDS FOR PARTICULATE MATTER SHALL BE MET.

STATE REGULATIONS

- * PENNSYLVANIA AIR POLLUTION CONTROL REGULATIONS, 25 PA. CODE SS 127.1 ET SEQ., WHICH REQUIRES THAT AIR EMISSIONS FROM NEW SOURCES BE CONTROLLED WITH THE BEST AVAILABLE TECHNOLOGY.
- * PENNSYLVANIA HAZARDOUS WASTE REGULATIONS, 25 PA. CODE PARTS 260 THROUGH 265, WHICH INCLUDES REGULATIONS THAT SET THE STANDARDS APPLICABLE TO GENERATORS, TRANSPORTERS, AND OPERATORS OF HAZARDOUS WASTE FACILITIES. THE CARBON UNITS WILL BE CONSIDERED A HAZARDOUS WASTE.
- * PENNSYLVANIA HAZARDOUS WASTE REGULATIONS, 25 PA. CODE S 262.46(C), WHICH STATES THAT HAZARDOUS WASTE DISCHARGES OR SPILLS SHALL BE CLEANED SO THAT THE DISCHARGE OR SPILL NO LONGER PRESENTS A HAZARD TO THE HEALTH AND SAFETY OF THE PUBLIC OR THE ENVIRONMENT.

EPA ALSO CONSIDERS POLICIES AND PROCEDURES THAT ARE NOT LEGALLY BINDING, BUT TO-BE-CONSIDERED (TBC). THIS INCLUDES THE AIR STRIPPER CONTROL POLICY (EPA OSWER DIRECTIVE 9355.0-28). THIS POLICY SUGGESTS THAT THE TOTAL VOC RELEASES FROM AIR STRIPPERS SHOULD NOT EXCEED 3 LBS/HR, 15 LB/DAY, OR 10 TONS/YR OF TOTAL VOCs.

IN THE DEVELOPMENT OF THIS ROD, THE GOALS OF OU2 ARE TAKEN INTO CONSIDERATION SINCE SOIL CONTAMINATION AFFECTS GROUND WATER. IN THE ROD FOR OU2, ON PAGE 32, EPA STATED:

"IN ORDER TO RESTORE THE AQUIFER TO ITS BENEFICIAL USE, THE REMEDIATION SYSTEM IMPLEMENTED IN EACH OF THE ALTERNATIVES WOULD OPERATE UNTIL SITE-SPECIFIC REMEDIATION GOALS ARE ACHIEVED. THUS THE AQUIFER WOULD BE REMEDIATED UNTIL THE CONTAMINATE LEVELS REACH THE MCLS, NON-ZERO MCLGS, OR BACKGROUND, WHICHEVER ARE LOWER.

IF IMPLEMENTATION OF THE SELECTED REMEDY DEMONSTRATES, IN CORROBORATION WITH HYDROGEOLOGICAL AND CHEMICAL EVIDENCE THAT IT WILL BE TECHNICALLY IMPRACTICABLE TO ACHIEVE AND MAINTAIN THE REMEDIATION GOALS THROUGHOUT THE AREA OF ATTAINMENT, THE USEPA IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO AMEND THE ROD OR ISSUE AN EXPLANATION OF SIGNIFICANT DIFFERENCES TO INFORM THE PUBLIC OF ALTERNATIVE GROUNDWATER GOALS."

TO THE EXTENT PRACTICABLE, OU3 WILL BE REMEDIATED TO A DEGREE WHICH IS CONSISTENT WITH THE GOALS OF THE REMEDY FOR OU2. THE REMEDIATION FOR OU3, COUPLED WITH THE REMEDIAL ACTION FOR OU2, FORMS

A SYSTEM INTENDED TO MEET THE REQUIREMENTS OF THE STATE ENVIRONMENTAL LAWS.

ALTHOUGH EPA AND PADER BELIEVE THAT THE REMOVAL OF THE CONTAMINATION FROM THE SOIL MAY REDUCE THAT AMOUNT OF TIME REQUIRED FOR THE PUMP AND TREAT SYSTEM, THERE IS NO EXISTING DATA TO DEMONSTRATE SUCH.

THE SOIL CONTAINS A RCRA HAZARDOUS WASTE, BUT THE LEVELS OF CONTAMINATION IN THE SOIL ARE BELOW LEVELS CURRENTLY CONSIDERED BY EPA TO BE WITHIN THE ACCEPTABLE RISK RANGE. AFTER REMEDIATION, THE STATUS OF THE SOIL WILL CONTINUE TO BE SUCH THAT THE CONCENTRATIONS OF THE LISTED WASTES ARE BELOW HEALTH BASED LEVELS, AND THE SOIL WOULD NO LONGER "CONTAIN" THE HAZARDOUS WASTES.

UNDER EPA'S "CONTAINED-IN" POLICY, "CONTAMINATED MEDIA (I.E., DEBRIS, SOIL, GROUNDWATER, SEDIMENTS) THAT CONTAIN RCRA WASTES MUST BE MANAGED AS IF THEY WERE HAZARDOUS WASTE UNTIL THE MEDIA NO LONGER CONTAIN THE HAZARDOUS WASTE (I.E., UNTIL DECONTAMINATED) OR UNTIL THEY ARE DELISTED. TO DATE, (EPA) HAS NOT ISSUED ANY DEFINITIVE GUIDANCE AS TO WHEN, OR AT WHAT LEVELS, ENVIRONMENTAL MEDIA CONTAMINATED WITH HAZARDOUS WASTE NO LONGER CONTAIN THE HAZARDOUS WASTE. UNTIL SUCH GUIDANCE IS ISSUED, (EPA) OR AUTHORIZED STATES MAY DETERMINE THESE LEVELS ON A CASE-SPECIFIC BASIS. (EPA) ALSO SUGGESTS THAT WHEN MAKING A DETERMINATION AS TO WHEN CONTAMINATED MEDIA NO LONGER CONTAINS A HAZARDOUS WASTE THAT A RISK ASSESSMENT APPROACH BE USED THAT ADDRESSES THE PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS OF THE HAZARDOUS CONSTITUENTS REMAINING." 56 FED. REG. 24456 (MAY 30, 1991).

EPA HAS PREVIOUSLY DETERMINED THAT NO DIRECT CONTACT RISK EXISTS DUE TO THE CONTAMINATED SOIL BEHIND THE FABRICATION BUILDING. UTILIZING THE SUMMERS MODEL, THE SOIL IS EXPECTED TO CURRENTLY AFFECT THE GROUND WATER BELOW MCLS. AFTER CAREFUL CONSIDERATION OF THE MULTIPLE OPERABLE UNIT APPROACH TO REMEDIATION AT THE SITE, EPA HAS DETERMINED THAT UPON IMPLEMENTATION OF THE REMEDY, OU3 AT THE SITE WILL NO LONGER CONTAIN RCRA HAZARDOUS WASTE.

THE COMPLETION POINT FOR THE SOIL REMEDIATION WILL BE DETERMINED BY THE PERFORMANCE IN THE FIELD, BASED UPON ACHIEVING EQUILIBRIUM IN THE SYSTEM. CONFIRMATORY SAMPLING WILL BE PERFORMED TO MEASURE THE AMOUNT THAT THE CONTAMINANT LEVELS HAVE BEEN REDUCED. EPA DOES NOT INTEND TO CONTINUE REMEDIATION FOR OU3 BEYOND THE SOIL VAPOR EXTRACTION (IN-SITU OR EX-SITU) SINCE IT IS KNOWN THAT LEVELS IN THE SOIL WILL BE BELOW LEVELS THAT ARE PROTECTIVE OF HUMAN HEALTH.

NONE OF THE ALTERNATIVES WOULD CAUSE A VIOLATION OF NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) DUE TO FUGITIVE DUST GENERATED DURING CONSTRUCTION ACTIVITIES (CLEAN AIR ACT, 40 CFR PART 50).

TRANSPORTATION OF MATERIAL TO RCRA PERMITTED FACILITIES WILL BE DONE IN COMPLIANCE WITH FEDERAL AND STATE REGULATIONS APPLICABLE TO GENERATORS AND TRANSPORTERS OF HAZARDOUS WASTES.

AS IN OU2, IF IMPLEMENTATION OF THE SELECTED REMEDY DEMONSTRATES, IN CORROBORATION WITH HYDROGEOLOGICAL AND CHEMICAL EVIDENCE, THAT IT WILL BE TECHNICALLY IMPRACTICABLE TO ACHIEVE AND MAINTAIN THE REMEDIATION GOALS THROUGHOUT THE AREA OF ATTAINMENT, THE EPA IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO AMEND THE ROD OR ISSUE AN EXPLANATION OF SIGNIFICANT DIFFERENCES TO INFORM THE PUBLIC OF ALTERNATIVE GROUND WATER GOALS.

THE LAND DISPOSAL RESTRICTIONS ARE AN ARAR WHEN "PLACEMENT" OCCURS AS PART OF AN ALTERNATIVE. ALTERNATIVES 2 AND 4 INVOLVE PLACEMENT SINCE CONTAMINATED SOIL WOULD BE DISPOSED OR TREATED OFF-SITE. THE LAND DISPOSAL RESTRICTIONS ARE NOT AN ARAR FOR ALTERNATIVES 3 AND 5 SINCE THE SOIL IS TREATED WITHIN THE SAME AREA OF CONTAMINATION FOR SOIL VAPOR EXTRACTION OR CAPPING.

A COMPLETE LISTING OF ARARS AND TBCS FOR ALL ALTERNATIVES CAN BE FOUND IN TABLE 17.

C. COST EFFECTIVENESS: THE SELECTED REMEDY, WHICH IS EXPECTED TO COST FROM \$53,500 TO \$66,400, DEPENDING ON WHETHER IN-SITU OR EX-SITU SOIL VAPOR EXTRACTION IS USED, AFFORDS OVERALL EFFECTIVENESS AND PROTECTS HUMAN HEALTH AND THE ENVIRONMENT PROPORTIONAL TO ITS COSTS. THE ONLY REMEDY WHICH IS LESS EXPENSIVE IS ALTERNATIVE 5 - CAPPING, WHICH COSTS \$34,900, BUT IT DOES NOT SATISFY OTHER SELECTION CRITERIA BELOW.

D. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE: THE REMOVAL OF HAZARDOUS WASTES CONTAINED IN SOIL, TO THE EXTENT PRACTICABLE PROVIDES A PERMANENT SOLUTION TO THE POTENTIAL RELEASE OF HAZARDOUS CONSTITUENTS TO THE GROUNDWATER SYSTEM. THIS WILL ENSURE THAT THESE HAZARDS DO NOT PROVIDE A HEALTH RISK TO NEARBY RESIDENTS. THE TREATMENT TECHNOLOGY TO BE UTILIZED, ALTHOUGH CONSIDERED INNOVATIVE, IS EFFICIENT AND COST EFFECTIVE. THE SELECTED REMEDY MEETS THE STATUTORY REQUIREMENT TO UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

E. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT: THE SELECTED REMEDY UTILIZES PROVEN AND READILY AVAILABLE TREATMENT TECHNOLOGIES AND MEETS THE STATUTORY PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT. SOIL VAPOR EXTRACTION WILL BE UTILIZED TO ADDRESS THE CONTAMINATED SOIL, WHICH IS EXPECTED TO AFFECT THE GROUND WATER AT THE SITE. THE CONTAMINATED GROUND WATER IS THE PRIMARY RISK POSED BY THE SITE, SINCE IT IS USED BY NEARBY RESIDENTS.

#DSC

DOCUMENTATION OF SIGNIFICANT CHANGES

THE PROPOSED PLAN WAS RELEASED FOR PUBLIC COMMENT ON AUGUST 8, 1991. THE PLAN USED THE TERMINOLOGY "SOIL VAPOR EXTRACTING" AND "SOIL VAPOR VENTING" TO DESCRIBE SEVERAL OF THE ALTERNATIVES. BOTH METHODS UTILIZE THE SAME BASIC TECHNOLOGY. SOIL VAPOR EXTRACTION REFERRED TO AN IN-SITU METHOD, AND SOIL VAPOR VENTING REFERRED TO AN EX-SITU METHOD. IN THIS ROD, HOWEVER, THE TERM "SOIL VAPOR EXTRACTION" IS USED BROADLY AND COVERS BOTH EX-SITU AND IN-SITU. WHERE DIFFERENCES BETWEEN THE TWO ARE DISCUSSED, IN-SITU OR EX-SITU IS SPECIFIED.

IN A LETTER RECEIVED AFTER THE ISSUANCE OF THE PROPOSED PLAN, PADER IDENTIFIED ADDITIONAL REGULATIONS THAT THEY CONSIDERED ARARS, SPECIFICALLY 25 PA. CODE SS 264.1, 264.300, 264.310 OR 25 PA. CODE SS 265.1, 265.300, 265.310, WHICH SPECIFY CLOSURE AND POSTCLOSURE CARE OF A LANDFILL. AFTER CONSIDERATION, EPA DETERMINED THAT 25 PA. CODE SS 265.1, 265.300, AND 265.310 WERE RELEVANT AND APPROPRIATE. EPA HAS WAIVED THESE REQUIREMENTS, CITING SECTION 121(D)(4)(D) OF CERCLA, WHICH ALLOWS WAIVERS WHEN THE SELECTED REMEDIAL ACTION WILL ATTAIN AN EQUIVALENT STANDARD OF PERFORMANCE AS COMPLIANCE WITH THE ARAR. THE SOIL VAPOR EXTRACTION SYSTEM, IN CONJUNCTION WITH THE GROUND WATER PUMP AND TREAT SYSTEM, WILL ATTAIN AN EQUIVALENT STANDARD OF PERFORMANCE.

THIS ROD SPECIFIES THAT ANY WATER CAPTURED DURING SOIL VAPOR EXTRACTION WILL BE TREATED WITHIN THE PUMP AND TREAT SYSTEM FOR OPERABLE UNIT 2. THEREFORE, ANY CONTAMINATION WITHIN THE CAPTURED WATER WILL BE PROPERLY TREATED.

#TA

TABLE 1

SUMMARY OF SURFACE SOIL SAMPLE ANALYSES

SAMPLE LOCATION	CONCENTRATION IN MILLIGRAMS PER KILOGRAM (MG/KG)					
	TCA	TCE	PCE	DCA	ETHYLBENZENE	XYLENE
16	0.019	0.001	0.053	ND		ND
17	22	0.06	0.46	4.2	0.92	11

ND = NOT DETECTED.

TABLE 2

SUMMARY OF EXPOSURE PATHWAYS

CONTAMINATED MEDIA	EXPOSURE PATHWAY
GROUND WATER	INGESTION (DRINKING) INHALATION (SHOWERING)
SURFACE WATER	INGESTION (RECREATION) DERMAL CONTACT (SWIMMING) FISH INGESTION
SOIL	INGESTION (CHILD TRESPASS) DERMAL CONTACT INHALATION (WORKERS)

TABLE 3

EXPOSURE ASSESSMENT ASSUMPTIONS

(FOR RESIDENTS UNLESS OTHERWISE NOTED)

ADULT MASS (KG)	:	70
CHILD MASS (AGE 3-6, KG)	:	17
LENGTH OF LIFETIME (YRS)	:	75
LENGTH OF ADULT EXPOSURE (YRS)	:	30
LENGTH OF CHILD EXPOSURE (YRS)	:	4
TAP WATER CONSUMED (1) (1/DAY)	:	2
FISH CONSUMED (G/DAY)	:	35
SURFACE WATER INGESTED (2) (1/DAY)		
ADULT	:	0.01
CHILD	:	0.1
RECREATION EVENTS/YEAR, ADULT	:	30
RECREATION EVENTS/YEAR, CHILD	:	60
REC. EVENT DURATION (HOUR)	:	1
SKIN SURFACE AREA, ADULT (SQ. CM)	:	18150
SKIN SURFACE AREA, CHILD (SQ. CM)	:	7540

SOIL INGESTION (MG/EVENT) : 200
 SOIL INGESTION EVENTS/YEAR : 10

(1) TAP WATER CONCENTRATION IS 90 PERCENT UPPER BOUND CONFIDENCE LEVEL OF THE MEAN CONCENTRATION.

(2) SURFACE WATER CONCENTRATION IS THE MAXIMUM OBSERVED CONCENTRATION.

TABLE 4

CANCER POTENCY FACTORS (CPFS) AND REFERENCE DOSES (RFDS)
 FOR CONTAMINANTS OF CONCERN.

CONTAMINANT	ORAL RFD (MG/KG/D)	INHALED RFD	ORAL CPF (MG/KG/D) (-1)	INHALED CPF
TCA	0.09(A)	NA	NA	NA
DCA	0.1(B)	0.1(B)	0.091(A)	0.091(A)
PCE	0.01(A)	NA	0.051(B)	0.0018(B)
TCE	NA	NA	0.011(B)	0.017(B)
DCE	0.009(A)	NA	0.6(A)	1.2(A)

NA = NOT AVAILABLE

A = IRIS (SOURCE OF DATA)

B = HEAST (SOURCE OF DATA)

TABLE 5

CANCER RISKS POSED BY THE CRYOCHEM SITE CURRENT EXPOSURES

EXPOSURE	RISK
INCIDENTAL SURFACE WATER INGESTION	
CHILD	2.48 X (10 ⁻⁷)
ADULT	2.26 X (10 ⁻⁸)
CHILD+ADULT	2.71 X (10 ⁻⁷)
DERMAL CONTACT WITH SURFACE WATER	
CHILD	1.63 X (10 ⁻⁵)
ADULT	3.57 X (10 ⁻⁵)
CHILD+ADULT	5.20 X (10 ⁻⁵)
FISH INGESTION	
CHILD	3.11 X (10 ⁻⁶)
ADULT	5.67 X (10 ⁻⁶)

CHILD+ADULT	8.78 X (10 ⁻⁶)
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ALL CURRENT EXPOSURE ROUTES COMBINED

CHILD	1.96 X (10 ⁻⁵)
ADULT	4.14 X (10 ⁻⁵)
CHILD+ADULT	6.10 X (10 ⁻⁵)

TABLE 6

CANCER RISKS POSED BY THE CRYOCHEM
SITE - POTENTIAL FUTURE EXPOSURES

EXPOSURE	RISK
DRINKING WATER	
CHILD	1.45 X (10 ⁻³)
ADULT	2.64 X (10 ⁻³)
CHILD+ADULT	4.09 X (10 ⁻³)
INHALATION WHILE SHOWERING	
CHILD	2.88 X (10 ⁻³)
ADULT	5.25 X (10 ⁻³)
CHILD+ADULT	8.13 X (10 ⁻³)
ALL FUTURE EXPOSURE PATHWAYS COMBINED	
CHILD	4.33 X (10 ⁻³)
ADULT	7.89 X (10 ⁻³)
CHILD+ADULT	1.22 X (10 ⁻²)

TABLE 7

CANCER RISKS POSED BY THE CRYOCHEM
SITE - ALL EXPOSURE PATHWAYS

EXPOSURE	RISK
CHILD	4.35 X (10 ⁻³)
ADULT	7.93 X (10 ⁻³)
CHILD+ADULT	1.23 X (10 ⁻²)

TABLE 8

CURRENT EXPOSURE HAZARD INDEXES (HI)

EXPOSURE	HAZARD INDEX
INCIDENTAL SURFACE WATER INGESTION	
CHILD	2.65 X (10 ⁻³)
ADULT	3.43 X (10 ⁻⁶)
DERMAL CONTACT WITH SURFACE WATER	
CHILD	1.74 X (10 ⁻¹)
ADULT	5.07 X (10 ⁻²)
FISH INGESTION	
CHILD	4.43 X (10 ⁻²)
ADULT	1.07 X (10 ⁻²)
ALL CURRENT EXPOSURE ROUTES COMBINED	
CHILD	2.21 X (10 ⁻¹)
ADULT	6.14 X (10 ⁻²)

TABLE 9

POTENTIAL FUTURE EXPOSURE HAZARD INDEXES

EXPOSURE	HAZARD INDEX
DRINKING WATER	
CHILD	5.76
ADULT	1.40
INHALATION WHILE SHOWERING	
CHILD	1.92 X (10 ⁻²)
ADULT	4.67 X (10 ⁻³)
ALL FUTURE EXPOSURE PATHWAYS COMBINED	
CHILD	5.78
ADULT	1.40

TABLE 10

HAZARD INDEXES FOR ALL EXPOSURE ROUTES

CHILD	6.00
ADULT	1.47

TABLE 11

SUMMARY OF SUMMERS MODEL CALCULATIONS.

VOC	MAXIMUM SOIL	ALLOWABLE SOIL
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	CONCENTRATION (MG/KG)	CONCENTRATION, WITH MCLS (MG/KG)
TCA	22	26
DCA	4.2	88
PCE	0.46	1.53
TCE	0.06	0.53
ETHYL BENZENE	0.92	654
XYLENE	11	2020

TABLE 12

REMEDIAL OBJECTIVES FOR OU3

1. PROTECT PUBLIC HEALTH, WELFARE, OR ENVIRONMENT.
2. PREVENT FURTHER MIGRATION OF CONTAMINANTS FROM THE SOIL TO THE GROUND WATER.
3. PREVENT SOIL CONTAMINANT MIGRATION INTO UNAFFECTED AREAS.

TABLE 13A

ESTIMATED COSTS FOR ALTERNATIVE 2: SAMPLING,
SOIL VAPOR EXTRACTION, EX-SITU, REMOVAL AND DISPOSAL
IN AN RCRA SUBTITLE C LANDFILL,
AND CONFIRMATORY SAMPLING

PRELIMINARY SAMPLING/ANALYSIS AND SOIL VAPOR VENTING/CONFIRMATORY SAMPLING	32,000
TRANSPORT TO LANDFILL	1,200
LOADING	1,200
DISPOSAL AT HAZARDOUS WASTE LANDFILL	29,050
BACKFILL AND REVEGETATION	1,000
HEALTH AND SAFETY EQUIPMENT	1,000
SUBTOTAL	65,450
BID CONTINGENCY (15 PERCENT)	9,818
SCOPE CONTINGENCY (20 PERCENT)	13,090
CONSTRUCTION SUBTOTAL	88,358
PERMITTING AND LEGAL ACTIVITIES (5 PERCENT)	4,418
ENGINEERING DESIGN (7 PERCENT)	6,185
CONSTRUCTION SERVICES (8 PERCENT)	7,069
TOTAL CAPITAL COST	106,029

TABLE 13B

ESTIMATED COSTS FOR ALTERNATIVE 2: SAMPLING,
SOIL VAPOR EXTRACTION, IN-SITU, REMOVAL AND DISPOSAL
IN AN RCRA SUBTITLE C LANDFILL,
AND CONFIRMATORY SAMPLING

PRELIMINARY SAMPLING/ANALYSIS AND SOIL VAPOR EXTRACTION/CONFIRMATORY SAMPLING	40,000
TRANSPORT TO LANDFILL	1,200
LOADING	1,200
DISPOSAL AT HAZARDOUS WASTE LANDFILL	29,050
BACKFILL AND REVEGETATION	1,000
HEALTH AND SAFETY EQUIPMENT	1,000
SUBTOTAL	73,450
BID CONTINGENCY (15 PERCENT)	11,018
SCOPE CONTINGENCY (20 PERCENT)	14,690
CONSTRUCTION SUBTOTAL	99,158
PERMITTING AND LEGAL ACTIVITIES (5 PERCENT)	4,958
ENGINEERING DESIGN (7 PERCENT)	6,941
CONSTRUCTION SERVICES (8 PERCENT)	7,933
TOTAL CAPITAL COST	118,989

TABLE 14A

ESTIMATED COSTS FOR ALTERNATIVE 3: SAMPLING,
SOIL VAPOR EXTRACTION, EX-SITU, AND CONFIRMATORY SAMPLING

PRELIMINARY SAMPLING/ANALYSIS AND SOIL VAPOR VENTING/CONFIRMATORY SAMPLING	32,000
HEALTH AND SAFETY EQUIPMENT	1,000
SUBTOTAL	33,000
BID CONTINGENCY (15 PERCENT)	4,950
SCOPE CONTINGENCY (20 PERCENT)	6,600
CONSTRUCTION SUBTOTAL	44,550
PERMITTING AND LEGAL ACTIVITIES (5 PERCENT)	2,228
ENGINEERING DESIGN (7 PERCENT)	3,119
CONSTRUCTION SERVICES (8 PERCENT)	3,564
TOTAL CAPITAL COST	53,460

TABLE 14B

ESTIMATED COSTS FOR ALTERNATIVE 3: SAMPLING,
SOIL VAPOR EXTRACTION, IN-SITU, AND CONFIRMATORY SAMPLING

PRELIMINARY SAMPLING/ANALYSIS AND SOIL VAPOR EXTRACTION/CONFIRMATORY SAMPLING	40,000
HEALTH AND SAFETY EQUIPMENT	1,000
SUBTOTAL	41,000
 BID CONTINGENCY (15 PERCENT)	 6,150
SCOPE CONTINGENCY (20 PERCENT)	8,200
CONSTRUCTION SUBTOTAL	55,350
 PERMITTING AND LEGAL ACTIVITIES (5 PERCENT)	 2,768
ENGINEERING DESIGN (7 PERCENT)	3,875
CONSTRUCTION SERVICES (8 PERCENT)	4,428
TOTAL CAPITAL COST	66,420

TABLE 15

ESTIMATED COSTS FOR ALTERNATIVE 4: SAMPLING,
REMOVAL AND DISPOSAL IN AN OFF-SITE INCINERATOR,
AND CONFIRMATORY SAMPLING

PRELIMINARY SAMPLING/ANALYSIS AND CONFIRMATORY SAMPLING	4,000
TRANSPORT, TREATMENT AND DISPOSAL AT A RCRA INCINERATOR	111,300
BACKFILL AND REVEGETATION	1,000
HEALTH AND SAFETY EQUIPMENT	1,000
SUBTOTAL	117,300
BID CONTINGENCY (15 PERCENT)	17,595
SCOPE CONTINGENCY (20 PERCENT)	23,460
CONSTRUCTION SUBTOTAL	158,355
PERMITTING AND LEGAL ACTIVITIES (5 PERCENT)	7,918
ENGINEERING DESIGN (7 PERCENT)	11,085
CONSTRUCTION SERVICES (8 PERCENT)	12,668
TOTAL CAPITAL COST	190,026

TABLE 16

ESTIMATED COSTS FOR ALTERNATIVE 5: SAMPLING AND CAPPING

PRELIMINARY SAMPLING/ANALYSIS	2,000
CONCRETE LAYER	6,380
SAND LAYER	1,700
GEOMEMBRANE	3,000
GUNDSEAL/CLAYMAX	3,000
HEALTH AND SAFETY EQUIPMENT	1,000
SUBTOTAL	17,080
BID CONTINGENCY (15 PERCENT)	2,560
SCOPE CONTINGENCY (20 PERCENT)	3,420
CONSTRUCTION SUBTOTAL	23,069
PERMITTING AND LEGAL ACTIVITIES (5 PERCENT)	1,150
ENGINEERING DESIGN (7 PERCENT)	1,160
CONSTRUCTION SERVICES (8 PERCENT)	1,850
SUBTOTAL CAPITAL COST	27,230
OPERATION AND MAINTENANCE, PRESENT WORTH	7,686
(ANNUAL REVIEW AND MAINTENANCE FOR 30 YEARS AT A 5 PERCENT INTEREST RATE)	
TOTAL CAPITAL COST	34,920